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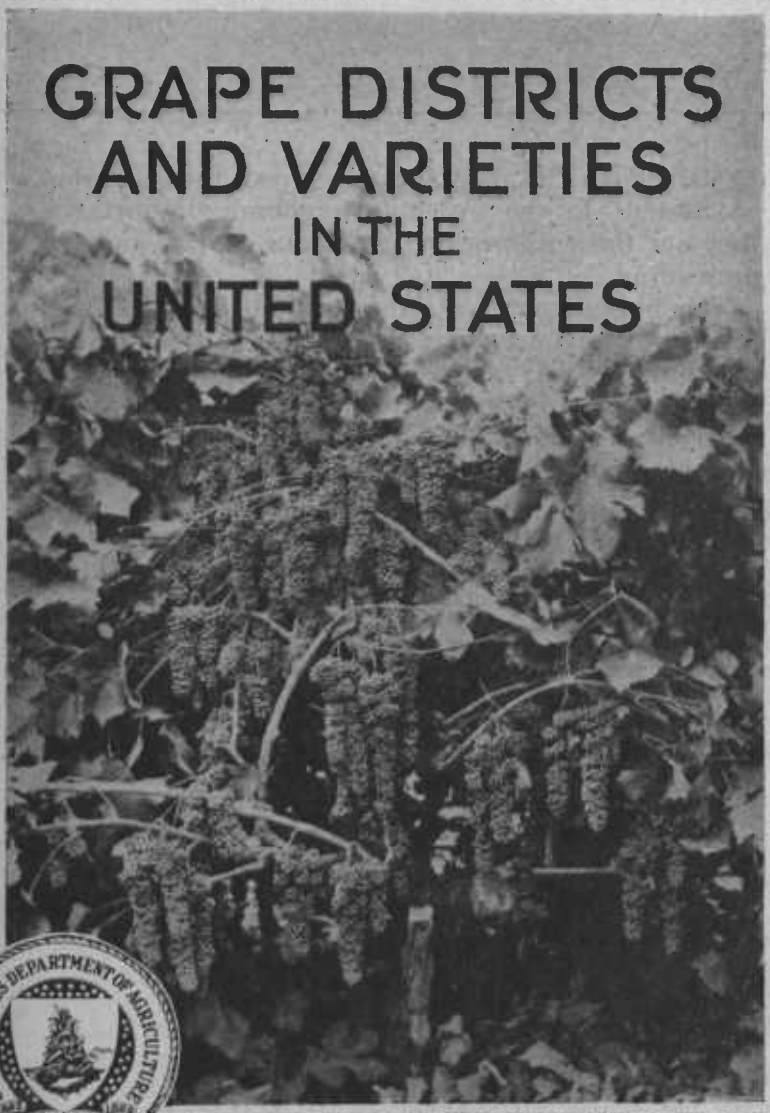
GRAPE DISTRICTS AND VARIETIES IN THE UNITED STATES



THREE TYPES of grapes are grown in the United States. In the order of economic importance they are the vinifera, the American euvitis, and the muscadine.

This bulletin sets forth in a general way the main geographic regions where these are found and makes recommendations as to the specific districts where each kind can be grown to advantage. A map of the United States showing the outlines of these 13 districts is included.

A large number of varieties of grapes are described, and the importance of selecting the right ones for planting under various climatic and soil conditions is emphasized.

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GRAPE DISTRICTS AND VARIETIES IN THE UNITED STATES

By GEORGE C. HUSMANN, *formerly Pomologist, Division of Horticultural Crops and Diseases, Bureau of Plant Industry*

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INTRODUCTION

Grape growing in the United States at the present time is almost entirely confined to three main types of grapes. In the order of their economic importance these are the vinifera, grown for the most part west of the Rocky Mountains and almost entirely in California; the American euvitis (various species of Vitis, subgenus Euvitis), grown in the region east of the Rocky Mountains and bordering on the Great Lakes, north of the Ohio River and west of the Mississippi to the one-hundredth meridian; and the muscadine, grown in the entire Atlantic coastal plain from the James River in Virginia to Florida, reaching well up into the Blue Ridge Mountains, along the Gulf coast to Texas, and northward along the Mississippi River to southeastern Missouri and the Tennessee River.

VINIFERA TYPE

The successful growing of grapes of the vinifera type (*Vitis vinifera*) is due largely to favorable climatic factors, including rarity of severe frosts, sufficient heat, dry air during the hotter part of the growing season, and absence of very low winter temperatures. These conditions, especially the dry growing season, reduce the development of the fungous diseases to which many of these varieties are supposed to be very susceptible and which, where prevalent, prevent commercial production.

Vinifera varieties may be grown in some parts of the American native-grape region if given special care and attention. However, in the greater part of the eastern United States the summers are too short or too humid for best commercial production.

Through the centuries of their culture in Europe, the vinifera varieties adapted themselves to or were developed to meet the various soil and climatic conditions in European countries. These varieties were introduced into the Colonies as the basis for the earliest attempts at grape growing there. But in the East they soon succumbed to attacks of phylloxera found on the native vines and to the fungous diseases which the climate encouraged. In the West, on the other hand, they found congenial climatic conditions [1] in the deserts and valleys and on the hillsides and mountain tops of California. (Figs. 1 and 2.) Even here, however, they show marked differences in behavior and value under the different soil and climatic conditions of the region.

There was a revival of interest in the cultivation of vinifera grapes in the eastern United States, when phylloxera-resistant stocks, on which they could be grafted, were developed.

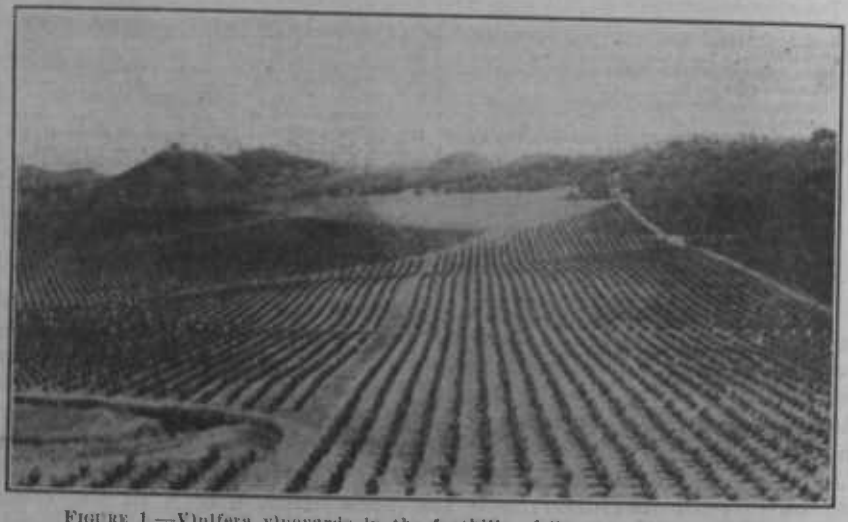

FIGURE 1.—Vinifera vineyards in the foothills of Sonoma County, Calif.

The *Phylloxera vitifoliae* was accidentally introduced into California, and its attacks there have made it advisable to grow all vinifera varieties on the phylloxera-resistant stocks. Establishment of such vineyards costs more, but the vines are more permanent and can be grown in many localities where own-rooted vines would not thrive.

The principal vinifera varieties that have been grown in this country are the Alexandria, Alicante Bouschet, Black Hamburg, Burger, Cabernet Sauvignon, Carignane, Chasselas de Fontainebleau, Cinsaut, Dodrelabi, Emperor, Flame Tokay, Green Hungarian, Grenache, Listan, Malaga, Mission, Mondense, Mourastel, Muscadelle du Bordelais, Olivette Blanche, Olivette Noire, Pedro Ximines, Petit Syrah, Pineau de Chardonnay, Purple Damascus, St.

[1] For information on adaptability and congeniality of grape varieties consult the following publications: U. S. Department of Agriculture Bulletin 209, Testing Grape Varieties in the Vinifera Regions of the United States; U. S. Department of Agriculture Technical Bulletin 146, Testing Phylloxera-Resistant Grape Stocks in the Vinifera Regions of the United States.

Macaire, Sauvignon Vert, Semillon, Sultana, Sultanina (*Thompson Seedless*), Sylvaner, Traminer, Valdepenas, Veltliner, Vermentino, and Zinfandel.

AMERICAN EUVITIS TYPE

The grapes designated in this bulletin as American euvitis have been derived for the most part from native species of bunch grapes or hybrids between them and the European or vinifera grapes. They can be grown over a wide range of territory and on a great diversity of soil types. There are few localities of this country to which some variety of this group is not adapted. In congenial conditions they also prove highly resistant to phylloxera.

At present nine-tenths of the plantings of American euvitis are of the Concord variety. The next most important variety is the Delaware. Other varieties that have been grown more or less exten-

FIGURE 2.—Vinifera vineyards in the San Bernardino Desert, Calif.

sively are the Agawam, Barry, Brighton, Brilliant, Campbell, Carman, Catawba, Champenel, Clevener, Clinton, Cynthiana, Diamond, Diana, Dutchess, Elvira, Eumelan, Goethe, Herbemont, Herbert, Isabella, Ives, Jefferson, Lenoir, Lindley, Missouri Riesling, Montefiore, Moore, Niagara, Noah, Norton, Pierce, Salem, Wilder, Winchell, Worden, and Wyoming.

MUSCADINE TYPE

The varieties of the muscadine type are those derived from the native species, *Vitis rotundifolia*. They are resistant to phylloxera, and after the fruit has set they are particularly resistant to fungous diseases, which accounts for the early and continued use of muscadines in farm homes throughout the region.

The Scuppernong has been grown more extensively than any other muscadine variety. Other varieties grown to some extent are the Eden, Flowers, James, Memory, Mish, and Thomas.

The trend of the grape industry in the United States since 1900, in so far as the distribution and extent of vineyards are concerned, has been for the most part steadily upward in the important muscadine and vinifera grape-growing States. Since 1920 Arkansas and Missouri have added large numbers of vines and California has more than doubled its acreage until it now produces more than 90 per cent of all the grapes grown in this country. To offset these increases, however, there have been decided decreases in the vine population of some of the formerly important producing States in the American euvitis region.

Information on the propagation, pruning, and training of grapes may be found in United States Department of Agriculture Farmers' Bulletin 471. Information on the insect and fungous enemies of grapes may be found in Farmers' Bulletin 1220, Insect and Fungous Enemies of the Grape.

SOILS

Improved varieties and hybrids have been developed from a large number of native grape species having a wide range of adaptation to soil and climatic conditions. For commercial production, lands that are easy to cultivate and will produce large crops are usually selected. Although many acres of soil, unsuited for other crops, will produce fair yields of grapes, the grape responds as generously to good soil and good treatment as does any other fruit grown.

Grapevines will grow on soils ranging from sandy loam to heavy clay. Gently sloping, well-drained calcareous loams of sufficient depth that are easily worked, fertile, but not excessively rich, and are underlain by an open porous subsoil, and sandy soils with a gravelly substratum are most favorable. Fairly deep clay-loam soils, underlain with subsoil that permits the vine roots (fig. 3) to penetrate, also give good results; however, if they are to be friable and pulverize well such soils must be plowed and cultivated when neither too wet nor too dry. Stony land on which general farming is impracticable but where vines can be cultivated will render fair returns from grapes only if the soil is loose and sufficiently deep for the roots to penetrate it and if plenty of fertilizer and humus are added. It is important that the subsoil be loose and porous, to permit the escape of surplus water and to allow the roots of the vines to penetrate. The surface soil can be changed and modified by cultivating and fertilizing, but the subsoil can not.

In soils excessively rich in humus and nitrogenous matter, as on many river and creek bottom lands, the vines make rank wood growth but the fruit is mediocre. On the other hand, sterile soil will not produce thrifty vines or heavy grape crops.

VINEYARD SITES

If the vines are planted only to yield a supply of grapes for home use they will naturally be placed in some convenient location near the house. Possibly they will overrun porches or arbors, furnishing shade and ornament as well as fruit. If their location is chosen from the viewpoint of convenience or beauty rather than soil suitability they may require more care and fertilizer to compensate for soil deficiencies.

When grapes are to be grown for commercial purposes, the location of the vineyard should be carefully chosen. Other things being

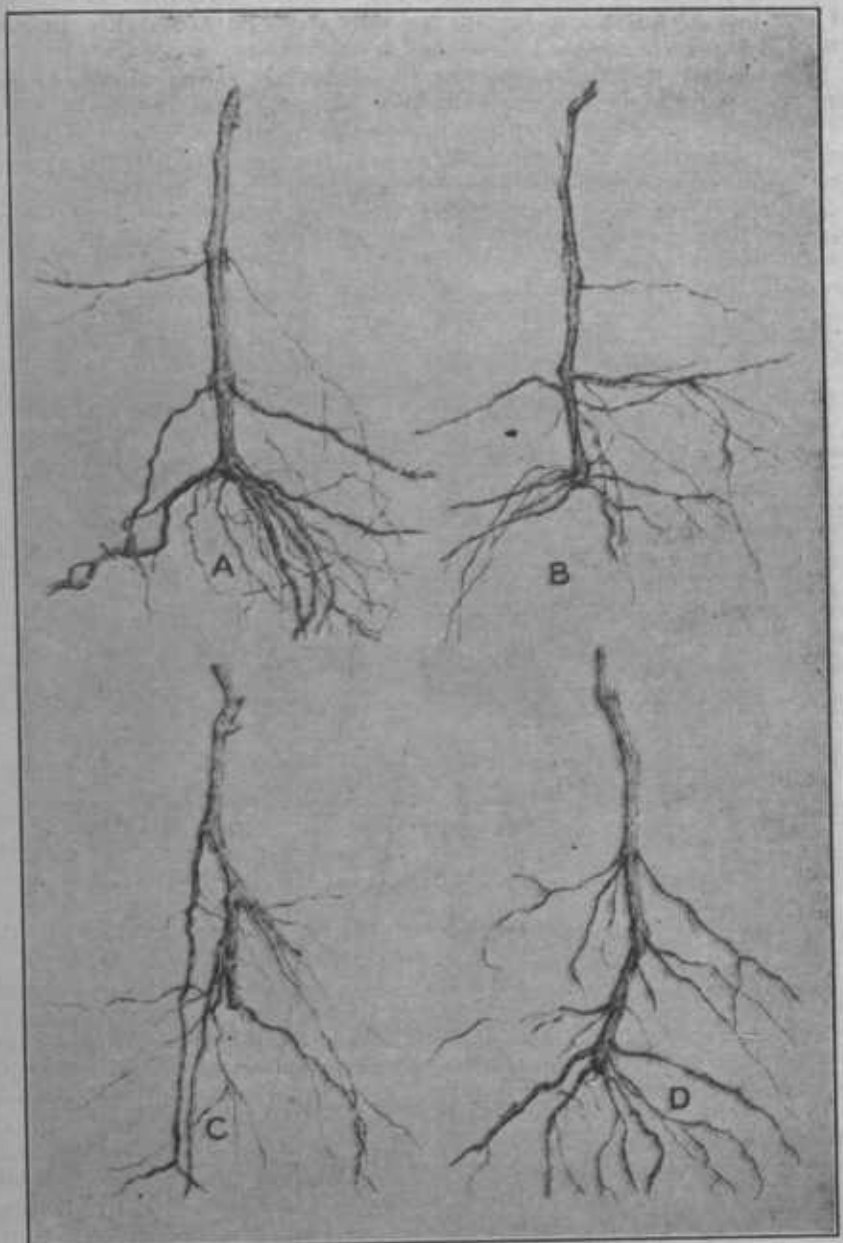

FIGURE 3.—Various types of root systems: A, Roots of the fleshy type; B, roots of the shallow or spreading type; C, roots of the deep-striking type; D, roots of the oblique type. Markings on A show how vine should be pruned for planting

equal, gradual slopes to the south and east are favorable for early growth and maturing of fruit. If practicable, the rows should be

run north and south so that the tops of the vines will shade and protect the trunks from sun scald. Hillside locations may be selected, those subject to serious washing being avoided. To prevent erosion, it is often advantageous to run the vine rows parallel with the contour of the hill.

Good air and water drainage are essential. It is also very important that the vineyard site be free from late spring frosts.

The local warm and cold air currents, especially in a hilly country, are more apparent at night and can best be discovered by going over the site at that time. Markets, labor supplies, and location of shipping points are important considerations in locating and establishing vineyards.

FIGURE 4.—Untrellised vineyard. First plowing, throwing soil away from the vines

PLANTING AND CULTURAL METHODS

VINIFERA VINEYARDS

Vinifera grapes are now set out 8 by 8, 9 by 9, 8 by 10, or 8 by 12 feet apart. The former practice was to set them 7 feet apart each way, and support them by stakes. Cane or spur-renewal pruning and training the vines to stakes are now practiced with most varieties, exceptions being the Sultanina and Emperor, which are pruned to a 4-arm renewal system and trained on a 2-wire upright trellis. Untrellised vineyards are cross-plowed and cross-cultivated. The soil is thrown away from the vines (fig. 4) in the first plowing, and thrown up to them (fig. 5) in the second. After the second plowing, cross disking and pulverizing (fig. 6) complete the cultural work of the season.

The important vinifera districts in California have distinct rainy and dry seasons. The rainy season usually commences about November 1, and showers may continue until about May 15. The pruning, planting, and cultural work is done during this time. Because of

the almost complete lack of rain during the remainder of the year, cultivation in California practically ceases with the end of the rainy season.

FIGURE 5.—Untrellised vineyard. Second plowing, throwing the soil up to the vines

The native bunch grapes or American euvitis varieties are planted 8 by 10, 8 by 12, 9 by 9, or 9 by 12 feet apart. Being trained on trellises, such vineyards can not be cross-plowed or cross-cultivated

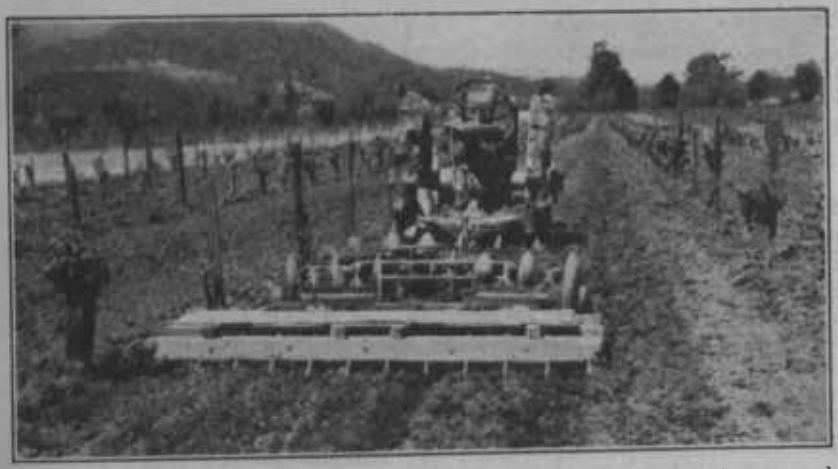

FIGURE 6.—Untrellised vineyard. Cross disking and pulverizing after second plowing finishes the cultural work of the season

as can the untrellised vinifera vineyards in California. In the past these grapes usually were pruned to the 4-arm renewal system and trained to a 2-wire upright trellis. In recent years the modified Munson system (fig. 7) appears to be gaining in favor.

These grapes are cultivated in practically the same manner as the vinifera type, except that continued cultivation and weed control throughout the summer are necessary because rainfall continues in the summer in the region in which they are grown. (Fig. 8.)

AMERICAN EUVITIS VINEYARDS

MUSCADINE VINEYARDS

Muscadine grapes for family use usually are grown on arbors near the house. When grown commercially they are generally trained to a horizontal (fig. 9) or overhead system by which the growth is spread as an overhead canopy about 7 feet above the ground and supported by posts, the vines usually being planted 20 feet apart each way. In some vineyards the vines are trained to an upright trellis, in which case they are usually planted 10 or 12 feet apart.

FIGURE 7.—Vineyard of American euvitis or native bunch grapes after first plowing. Row on left trained to 4-arm renewal system. Row on right trained to modified Munson system

Because of the climatic conditions in the region in which they are grown, the muscadine grapes, like the native bunch grapes, must be cultivated throughout the summer. If the vines are grown as overhead canopies cross-plowing and cross-cultivation can be carried on underneath them, but if they are trained to upright trellises the work must be done between the rows.

TOOLS AND IMPLEMENTS

The cultural implements used are similar for all three types of grapes. In California, where the vineyards are much larger than elsewhere in the United States, tools and implements are purchased especially for grape cultivation. The regular cultural implements in general farm use are employed in the other grape-growing areas.

DISTRICTS AND SUITABLE VARIETIES

Soil and climate are the two most important factors governing grape culture and distribution. The large number of indigenous grape species of the United States shows this. They outnumber the species so far discovered in all the rest of the world, and each has definitely adjusted itself to certain soil, climatic, and other conditions and will thrive only under those conditions.

Varietal recommendations in this publication are based upon a knowledge of the adaptability of the parent species of the varieties discussed; upon varietal studies carried on in the numerous experimental vineyards located by the United States Department of Agriculture, from time to time, in the various important grape districts of this country; upon cooperative investigations carried on with State agricultural colleges and State agricultural experiment stations; upon the reports of growers to whom the department has

FIGURE 8.—American cuvitis or native bunch grape vineyard in summer after the soil has been plowed up to vines and cultivated

distributed grape varietal material for testing; and upon extensive travel and studies made throughout the country.

In discussing adaptability of grape varieties to different portions of the United States a map (fig. 10) is used, which shows 13 main districts. Varieties likely to succeed are suggested for each district.[2] Arbitrary lines indicate the approximate boundaries of these districts, but in fact there is a gradual shading of each district into the others adjacent. Each district includes localities in which grapes are subject to injury from late spring frosts or which for other reasons are not suited for vineyard purposes. Each district also includes localities particularly suitable for special lines of grape growing.

Large bodies of water modify climatic conditions along their shores in such a way as to encourage grape growing. This is dem-

[2] Varieties particularly useful for juice purposes are indicated by asterisks (*).

onstrated along the shores of Lake Ontario, Lake Erie, and smaller lakes in New York; along the shores of Lake Erie in Pennsylvania and Ohio; along the shores of Lake Michigan and smaller lakes in Michigan. Altitude also has its influence. On the mountain sides throughout an area in southwestern North Carolina, northwestern South Carolina, and northern Georgia there are thermal belts in which vinifera varieties, principally successful in California, can be grown. On other lands, adjacent to the thermal belts mentioned, but not having the same conditions of temperature, these varieties will not grow well.

Changes in cultural practices and the development of irrigation have a far-reaching influence on the possibilities of grape culture. Irrigation made possible the raisin industry in California, now the largest in the world. Through it the Imperial Valley, formerly a

FIGURE 9.—Muscadine vineyard trained to horizontal overhead system

hot desert waste in Imperial County, has become an early-grape producing section; in southern Arizona grape districts are developing, and in Idaho, Colorado, New Mexico, and the eastern portions of Oregon and Washington (roughly indicated by cross-lined patches in fig. 10), grape growing can now be successfully carried on. In fact, in nearly any arid part of the United States it is possible to grow, under irrigation, at least enough grapes for family use.

DISTRICT NO. 1

This district takes in the northern portions of Maine, New Hampshire, Vermont, New York, Michigan, Wisconsin, Minnesota, and South Dakota, all of North Dakota, and all but the extreme western part of Montana. It is characterized by low winter temperatures and a comparatively short growing season. Minnesota, South Da-

kota, North Dakota, and Montana are further characterized by drying winds and droughts. Only very hardy, early-ripening varieties, such as the Alpha*, Beta*, Dakota*, Hungarian, Janesville*, Monitor*, and Suelter, are at all worthy of trial.

DISTRICT NO. 2

This is the most important district growing improved varieties of American euvitis, their hybrids, and hybrids between them and the vinifera species. On the shores of the important lakes in this district are the largest acreages and the greatest commercial production of such grapes. It comprises most of New England and New York; the northern portions of New Jersey, Pennsylvania, Ohio, and Indiana; most of Michigan; and the northern half of eastern Illinois. The varieties suggested for this district are: White—Diamond, Em-

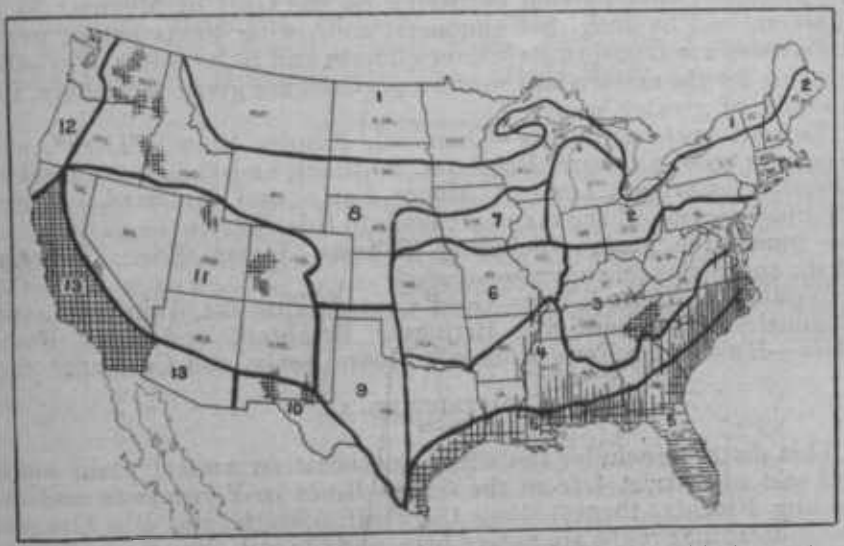

FIGURE 10.—Map of the United States showing the districts into which the country is divided in applying the grape variety recommendations. The shading is explained in the text referring to the various districts

pire State, Niagara, and Winchell*; red—Agawam, Brighton, Catawba, Delaware*, Goethe, Lucile, and Goff; black—Campbell, Concord*, Ives*, Moore, and Worden.

DISTRICT NO. 3

In area this is one of the largest of the native American euvitis districts, comprising all of Delaware, Maryland, and West Virginia; most of Virginia, Kentucky, and Tennessee; the southern portions of New Jersey, Pennsylvania, Ohio, and Indiana; the western portions of North Carolina and South Carolina; and the northern portions of Georgia and Alabama. Soil and climatic conditions in this district differ greatly.

Varieties suggested for this district are: White—Diamond, Elvira*, Empire State, Hidalgo, Niagara, Rommel, Winchell*, and Wapa-

nuka; red—Agawam, Brighton, Brilliant, Catawba*, Delaware, Goethe, Lucile, and Goff; black—Campbell Early, Carman, Concord*, Cynthiana*, Hernito, Hubbard, Husmann, Ives*, Lenoir*, Moore Early, Norton*, and Worden. It is believed that within the crosslined area shown on the map in this district there are thermal locations where vinifera varieties grafted on phylloxera-resistant stock can be successfully grown in addition to American euvitis.

DISTRICT NO. 4

Beginning in southeastern Virginia, this large district extends through the central portions of North Carolina, South Carolina, Georgia, Alabama, and Mississippi; western Tennessee and Kentucky; southeastern Missouri; eastern and southern Arkansas; southern Oklahoma; the northern half of Louisiana; and all of eastern Texas except that portion bordering on the Gulf of Mexico. It is characterized by long, hot summers, and owing to its extent great differences are found in its winter climate and in its soils. Varieties suitable for the eastern and western portions are given separately, for the sake of greater accuracy.

Eastern portion: White—Diamond, Empire State, Elvira*, and Niagara; red—Agawam, Brighton, Brilliant, and Delaware: black—Concord*, Carman, Lenoir*, Moore Early, and Hubbard. Where the lined portion of the map extends into this district the varieties of the muscadine group, including Thomas, James, Eden, Flowers, Mish, and Scuppernong, also succeed.

Western portion: White—Gold Coin, Wapanuka, Winchell*, and Rommel; red—Headlight, Brilliant, Brighton, and Last Rose; black—Husmann*, Fern Munson*, Moore Early, and Carman.

DISTRICT NO. 5

This district includes the entire southeastern coastal plain south and east of district 4 from the James River in Virginia to and including Florida, thence along the Gulf coast to the Rio Grande. The muscadine groups are native here, and the soil, climatic, and other conditions are particularly suited to them. Since they will produce some fruit with practically no care, culture, training, or pruning, and because of their resistance to prevalent fungous diseases so common to euvitis, muscadine varieties have been the leading grapes in this section since the earliest white settlements were made. In Figure 10 vertical lines show where *Vitis rotundifolia* is native, horizontal lines where *V. munsoniana* is native, and crosslines near and along the Gulf coast, where *V. rotundifolia* can be grown. The Scuppernong is the only listed light-colored variety, and is more extensively grown than all the other catalogued varieties combined. The better catalogued dark-colored sorts are: Eden, Flowers, James, Memory, Mish, and Thomas, all of which are pistillate and should be interplanted with a sufficient number of staminate vines to pollinate them.

Euvitis varieties suggested for this district are: White—Wapanuka, Hidalgo, Niagara, and Krause; red—Ellen Scott, Captivator, Last Rose, Delaware, and Valhallah; black—Beacon, Cloeta, and

Carman. By adopting special methods of training and by grafting on phylloxera-resistant stocks, certain vinifera or European grape varieties have been grown. However, they are not recommended for general planting in this district.

DISTRICT NO. 6

This district includes the southern half of Illinois, most of Missouri, the northwestern half of Arkansas, the northern and eastern part of Oklahoma, all of eastern Kansas, and a corner of southeastern Nebraska. It has rather hot summers and fairly cold winters; it varies from rolling prairies to rather pronounced mountain areas. It includes a considerable number of this country's most important rivers.

The following varieties are suggested for it: White—Diamond, Elvira*, Empire State, Hidalgo, Niagara, Rommel, and Winchell*; red—Agawam, Brighton, Brilliant, Catawba, Delaware*, Goethe, Goff, and Lucile; black—Campbell Early, Concord*, Cynthiana*, Hernito, Hubbard, Husmann, Ives*, and Moore Early.

DISTRICT NO. 7

This district embraces the extreme southern portion of Wisconsin, northwestern Illinois, eastern and southern Iowa, and the central portion of eastern Nebraska—a rather rolling open country, having rather severe winters and a moderately long growing season.

Varieties that may be grown successfully are: White—Diamond Elvira, Empire State, Niagara, and Winchell*; red—Brighton, Delaware*, Goff, and Lucile; black—Campbell Early, Concord*, Hernito, Ives*, Moore Early, and Worden.

DISTRICT NO. 8

This district embraces northeastern Michigan; northern Iowa; central Wisconsin; southern Minnesota and South Dakota; almost all of eastern Oregon, eastern Washington, and eastern Colorado; western Montana, Nebraska, and Kansas; and almost all of Wyoming and Idaho. It is larger than any other district and varies much in soil, climatic, and other conditions. It is characterized by low winter temperatures and drying winds, a large part having very limited rainfall. No part is particularly well adapted to grape growing, and in it only the very hardy varieties have a chance of succeeding. Those for the eastern and western portions are stated separately.

Eastern portion: White—Diamond, Elvira, Niagara, and Winchell*; red—Brilliant, Delaware*, and Goff; black—Concord*, Ives*, Lenoir*, Moore Early, and Worden.

Western portion: White—Diamond and Winchell; red—Agawam, Goff, Delaware*, and Vergennes; black—Concord*, Isabella, and Worden.

Attention is called, however, to some localities in the western portion of this district in which the choicer and more tender grapes, including the vinifera varieties, can be grown under irrigation if the vines are winter covered. Six of these localities are in Washington, Oregon, and Idaho. They are indicated by crosslines in Figure 10

DISTRICT NO. 9

This district, a portion of the southern Great Plains area, includes the central part of Texas, western Oklahoma, and eastern New Mexico. It is characterized by comparatively high altitude, limited rainfall, and rather constant winds.

The following varieties are suggested as likely to succeed in it: White—Gold Coin, Hidalgo, Krause, Rommel, and Wapanuka; red—Captivator, Delaware*, Ellen Scott, Last Rose; black—Bailey*, Beacon, Carman, Cloeta, Herbemont*, Husmann, Lenoir*, and Manito.

DISTRICT NO. 10

District No. 10 includes only southern New Mexico and the extreme western portion of Texas. Its winter temperatures are not very low. Indicated on the map as cross-lined patches, there are some irrigated districts in the Rio Grande and Pecos Valleys of New Mexico and in the El Paso section of Texas in which a few vinifera varieties are grown, the Mission being the principal one. Sultanina (*Thompson Seedless*), Sultana, Alexandria, Black Hamburg, and other varieties have been tried there and might succeed, especially if given winter protection.

DISTRICT NO. 11

This district comprises western Colorado, the northwestern half of New Mexico, the northern half of Arizona, all of Utah and Nevada, and the mountainous portion of eastern California. It varies exceedingly—from snow-capped mountains of high altitude to irrigated valleys. In the dry-land areas conditions are adverse to grape culture and are prohibitive at altitudes exceeding 7,000 feet. Commercial grape culture should not be attempted in this district except in irrigated localities free from alkali. Two such localities in Colorado and one in Utah are shown on the map.

If grafted on phylloxera-resistant stocks, the more hardy vinifera varieties can probably be grown in this district, especially if winter protection be given them. These include such sorts as Black Hamburg, Chasselas de Fontainebleau, Flame Tokay, Jura Muscat, Sylvaner*, and Zinfandel*.

American varieties (which should need no winter covering) suggested for trial planting are: White—Diamond, Niagara, and Winchell*; red—Brighton, Goff, and Delaware*; black—Concord*, Isabella, and Worden.

DISTRICT NO. 12

This district embraces the extreme northwestern portion of California, western Oregon, and western Washington. Such vinifera varieties as Black Hamburg, Chasselas de Fontainebléau, Flame Tokay, Jura Muscat, Sylvaner*, Sauvignon Vert*, and Zinfandel* have succeeded in the Willamette Valley and in southwestern Oregon.

The prevailing conditions, however, indicate that better results would be obtained with improved American varieties. Suggested for trial planting in this district are: White—Diamond, Niagara, and Winchell*; red—Agawam, Brighton, and Delaware*; black—Concord, Campbell Early, and Worden.

DISTRICT NO. 13

With the exception of a number of developments in the southern portion of Arizona in recent years, the grape production of district No. 13 is located entirely in California.

In the southern part of this district, and in the southern half of California, which includes the principal raisin-producing section, the following are the important varieties grown: Muscat of Alexandria*, Sultanina* (*Thompson Seedless*), Malaga, Listan (*Golden Chasselas*), Zinfandel*, Alicante Bouschet*, Feher Szagos*, Emperor, Sultana*, Mission*, Panariti*, Ohanez, Hunisa, and Castiza.

From the central portion of California to and including the northern end of district No. 13, the choicest varieties for table, storage, juice purposes, and shipping grapes have been grown, among the more important being Alicante Bouschet*, Calmette*, Carignane*, Black Hamburg, Black Prince, Burger*, Cabernet Sauvignon*, Chablis*, Chasselas Dorè, Chauche Gris*, Chauche Noir*, Cinsaut, Cornichon, Ferrara, Flame Tokay, Green Hungarian*, Grenache*, Gros Guillaume, Mataro*, Mission*, Mourastel*, Muscateller, Olivette Blanche, Ohanez, Panariti*, Pedro Ximines*, Petit Syrah*, Prune de Cazouls, Sauvignon Vert*, Semillon*, Sultanina*, Sylvaner*, Valdepenas, Veltliner*, and Zinfandel*.

Under present conditions the following varieties are suggested for the various purposes for which grapes are now used. For juice purposes—Petit Syrah*, Grenache*, Carignane*, Alicante Bouschet*, Mission*, and Palomino*; for juice and table-grape purposes—Gros Guillaume, Prune de Cazouls, Black Hamburg, Muscat Hamburg, Black Prince, and Alexandria; for shipping—Castiza, Gros Guillaume, Ohanez, Emperor, Cornichon, Olivette Blanche, Muscat Hamburg, Monukka, Prune de Cazouls, Terret Monstre, and Red Muscat; for raisins—Alexandria, Monukka, and Sultanina; for currants—Panariti.

BRIEF DESCRIPTIONS OF THE VARIETIES

There are four kinds of flowers in grapes: The practically pistillate or female flowers with weak, recurved stamens, which usually do not produce viable pollen (varieties producing such flowers are self-sterile); staminate or male flowers with abundance of virile pollen but with abortive pistils, nonfruitful; perfect or hermaphrodite self-fertile flowers; and gradations among these three classes, presenting varying degrees of self-sterility or fertility.

For home plantings of the American native bunch grape sorts that usually are self-fertile or an assortment of varieties are suggested. Their flowering characteristic is seldom an important consideration. If, in commercial grape growing, it is desired to produce a special variety which is self-sterile, the vines must be interplanted with varieties blossoming at the same time and having an abundance of virile pollen. One such vine usually is sufficient to pollinate 10 self-sterile vines. The following brief descriptions of grape varieties cover both the self-fertile and self-sterile varieties. These descriptions not only mention specifically the districts in which each variety can be grown, but indicate the special merit or importance of each variety and state whether it is commercially grown.

The sugar content in the expressed juice, as determined by Balling-scale readings, is given when available. Several readings for each vinifera variety were obtained through several seasons, and the range of the tests is given. Sugar readings for the same variety will differ from year to year and under different growing conditions. Therefore, the range within which the readings on the variety are likely to fall is given.

For the American euvitis and muscadine grape varieties a single reading, representing the average of a number of Balling-scale determinations, is given. It is believed that these readings represent approximately the average for well-grown, well-matured, typical grapes of each variety. The same applies to the acidity readings, which are expressed as tartaric acid in grams per 100 cubic centimeters.

J. S. Caldwell and others have shown that the specific gravity of the juice as read on the Balling scale is not an exact measure of the sugar content of the juice, considerable differences being noted sometimes between Balling-scale readings and actual chemical determinations. However, Balling-scale readings are widely used, especially in California, as a measure of maturity and quality in grape varieties, even though they do not accurately measure the sugar content.

VINIFERA TYPE

Because none of the vinifera varieties resist the *Phylloxera vitifoliae*, all will need to be grown by grafting on phylloxera-resistant stocks.

WHITE VARIETIES

Alexandria.—Syn., *Muscat of Alexandria.* (Vin.) Origin, Africa. Vine a robust, medium, stocky grower, productive, but does not always set well. Flowers self-fertile. Cluster straggling, long, loose, never compact even when perfect; peduncle long, reddish brown. Berry large, ellipsoidal, surface smooth, yellowish green, bloom white; adherence excellent. Skin tough and thick. Flesh meaty, firm, fairly juicy. Flavor aromatic, musky, fruity, and rich; quality excellent. Sugar 19° to 29° Balling; acid 0.46 to 0.66. Ripens midseason. This is the most important raisin variety, also a very important shipping grape, as it carries well, looks well, and its peculiar muscat flavor is much admired. It seems to have been first cultivated by the Arabs. Suggested for districts 10 and 13.

Ohanez.—Syn., *Almeria.* (Vin.) Origin, Spain(?). Vine a robust, stocky, open, vigorous grower. Very productive, but not self-fertile and should be interplanted with a pollinizer. Cluster medium to above medium and uniform in size, fairly loose to compact; globose, conical, occasionally shouldered; peduncle long and stout. Berry medium to large, persistent and firm, oval, often slightly flattened at both ends, dull yellowish green with occasional brownish markings on sunny side. Skin medium thick, tenacious, adheres to pulp. Flesh greenish white, tenacious, firm; when fully ripe of good quality. Flavor indifferent sweetwater. Sugar 20° to 24° Balling; acid 0.56 to 0.90. Ripens late. Noted for superior shipping and storage qualities, which make it exceedingly valuable, but should be grown for no other purpose. Suggested for district 13.

Olivette Blanche.—(Vin.) Origin, France. Vine a vigorous spreading grower, productive. Flowers self-fertile. Cluster large to very large, triangular and cylindrically tapering, sometimes slightly shouldered, medium loose but well filled, peduncle rather thin and long. Berries oval, medium to above medium in size, color light yellow, flushed light brown on sunny side, bloom white, heavily veined, slightly transparent, persistent, rather firm. Skin thin, tough, adheres slightly to pulp. Flesh meaty, moderately firm, juicy, somewhat coarse-grained. Flavor fruity, pleasant, sprightly, with slightly milky after-

taste. Sugar 20° to 24° Balling; acid 0.53 to 0.90. Ripens medium late. A valuable shipping grape of attractive appearance and good keeping qualities. Also makes a good raisin. Suggested for districts 10 and 13.

Palomino.—Erroneously *Golden Chasselas.* (Vin.) Origin, Spain. Vine vigorous, rather strong grower, very productive. Flowers self-fertile. Cluster large, conical, loose, somewhat limby. Berries above medium to large in size, slightly oblate, light green to yellow, transparent; adherence good. Skin medium thick and medium tough. Flesh fairly meaty, rather soft, juicy. Flavor sweetwater, rich; quality very good. Sugar 21° to 25.6° Balling; acid 0.35 to 0.67. Ripens midseason. An all-around good grape, which has been very extensively grown for white-juice purposes, but also ships well. Suggested for districts 10 and 13.

Pedro Ximenes.—(Vin.) Origin, Spain. Vine a very vigorous grower and productive. Flowers self-fertile. Clusters large, cylindroconical, sometimes shouldered, loose to well filled. Berries medium to large, slightly oblong, light-green color changing to golden at maturity; bloom white; adherence excellent. Skin medium thin, tough. Flesh pulpy, fairly juicy, sweet, and of good quality. Sugar 21° to 23° Balling; acid 0.46 to 0.67. Ripens midseason. Ships fairly well and is an excellent white-juice grape. Suggested for districts 10 and 13.

Sultanina.—Syn., *Thompson Seedless.* (Vin.) Origin, Persia(?). Vine a strong, long-jointed, slender grower. Exceedingly productive. Flowers self-fertile. Cluster long, fairly loose, often fairly compact, large, from 6 to 16 inches long; peduncle 1½ to 2 inches long, medium sized. Berries oblong, above medium size, ⅝ to ¾ inch by ¾ to 1 inch; adherence good. Color light yellowish green, flushed when fully ripe; bloom white and glossy. Skin medium thick, tough. Flesh fairly meaty, moderately firm, fairly juicy; flavor sweet with delicious acidity. Sugar 22° to 27.8° Balling; acid 0.45 to 1.22. Ripens early. An excellent dessert, table, shipping, and raisin grape, popular and most valuable. The seedless-raisin grape of commerce. Suggested for districts 10 and 13.

Sultana.—(Vin.) Origin, Persia(?). Vine strong, slender; fairly long-jointed grower; productive. Flowers self-fertile. Cluster very large and loose, shouldered; pedunele rather long and slender. Berries small, globular, golden yellow; bloom white. Skin fairly thin and tough, adhering to pulp. Flesh firm, sweet, juicy, and without seeds. Sugar 23.5° Balling; acid 0.89. Ripens medium early. Noted as seedless-raisin grape, also makes a very delicate juice of straw color and great body. Suggested for districts 10 and 13.

Terret Monstre.—Erroneously *Malaga.* (Vin.) Origin, Spain(?). Vine very vigorous and very productive. Flowers self-fertile. Cluster large to very large, regularly tapering, slightly compact; pedunele solid, long. Berries large, ellipsoidal, sometimes slightly obovoid, yellowish green at ripening time with russet spots when overripe. Bloom white, adherence good. Skin thick, tough, adhering to pulp. Pulp slightly juicy, firm. Flavor sweetwater. Sugar 22.6° to 24.8° Balling; acid 0.44 to 0.65. Ripens midseason. This has been the most important white table grape grown in California. It has frequently been used as a raisin grape. Suggested for districts 10 and 13.

Panariti.—(Vin.) Origin, Greece. United States Department of Agriculture introduction No. 6429 in 1901. Vine robust, slightly spreading, dense upright grower, very productive when girdled at blossoming time. Flowers self-fertile. Cluster very long, almost cylindrical, frequently enlarged at terminal, often shouldered, sometimes winged, medium compact; pedunele medium size, long, soft, fleshy, brown. Berry globular, very small, smooth, amber, bloom white, persistent, firm, and seedless. Flesh white, soft, juicy, and of excellent quality. Flavor rich, sweet, and characteristic. Sugar 28° to 35° Balling; acid 0.57 to 0.77. Second crop clusters small, round, with large-seeded berries. Ripens very early. Best variety for curing into currants. A juicy grape of superior value. Because of its extreme earliness, rich eating quality, and seedless berries a trade outlet as a very early eating and shipping grape is possible. Suggested for district 13.

RED VARIETIES

Castiza.—Syn., *Maraville de Malaga.* (Vin.) Origin, Spain. Introduced by the United States Department of Agriculture in 1905. Vine a robust, upright, spreading grower, very vigorous and very productive. Flowers self-fertile. Clusters large to very large, fairly loose to compact, conical, gradually tapering, slightly single-shouldered and sometimes double-shouldered; pedunele stout,

woody, long, light brown. Berry bright to dark red with bluish bloom, globular to oval, persistent. Skin thick, tough, adheres to pulp; pigment light red. Flesh pearly, meaty, firm, fairly juicy, and excellent in quality. Flavor fruity sweetwater. Sugar 22° to 26° Balling; acid 0.42 to 0.57. A remarkably handsome red grape of excellent merit and fine eating, shipping, and storage qualities. Suggested for district 13.

Chasselas de Fontainebleau.—(Vin.) Origin uncertain. Vine a vigorous, free grower, very productive. Flowers self-fertile. Cluster medium to below in size, long, tapering, broadly shouldered, and somewhat loose. Berries medium to below in size, globular, pale greenish yellow, transparent when fully ripe, flushed with bright cinnamon russet on sunny side. Flesh firm yet tender, juicy, sweet, and agreeable to the palate. Sugar 23° to 26.4° Balling; acid 0.46 to 0.55. Ripens medium early to midseason. The most generally grown grape in all vinifera grape-growing countries, is a good all-purpose grape and makes a white juice of excellent quality. Suggested for districts 10 and 13.

Red Muscat.—Syn., *Red Hanepoot*. (Vin.) Origin, Africa. Vine a robust, stocky grower, very productive. Flowers self-fertile. Cluster medium loose to fairly compact, long tapering; peduncle medium to long, reddish brown. Berry large, ellipsoidal, surface smooth, yellowish red; bloom white; adherence excellent. Skin tough and thick. Flesh meaty, firm, fairly juicy. Flavor aromatic, fruity, and rich, and of excellent quality. Sugar 22° to 30° Balling; acid 0.47 to 0.67. Ripens midseason. A handsome eating and shipping grape of excellent quality. Suggested for district 13.

Emperor.—(Vin.) Origin unknown. Vine a vigorous, long, spreading grower, often very productive. Flowers self-fertile. Clusters large, pyramidal, loose to well filled; peduncle very long, medium hard. Berries large, obovoid, elongated, pulpy, medium juicy, color grizzly to dark cherry red. Skin medium thick and medium tough. Flesh greenish white, firm. Flavor indifferent. Sugar 20° to 24° Balling; acid 0.63 to 0.94. Ripens late. The Emperor is one of the leading late-shipping and storage grapes grown in California. Suggested for district 13.

Flame Tokay.—(Vin.) Origin, Algeria(?). Vine a vigorous, erect, stocky grower; very productive. Flowers self-fertile. Clusters large to very large, almost flat on end, firm, not juicy, color red. Skin medium thick, medium tough. Flesh greenish white, firm, and of fair quality when fully ripe. Flavor, indifferent sweetwater. Sugar 20.8° to 27° Balling; acid 0.48 to 0.76. Ripens midseason. A good shipping grape and should be grown for that purpose only. At present the most extensively grown shipping grape of California. Suggested for districts 10 and 13.

BLACK VARIETIES

Alicante Bouschet.—(Vin.) Origin, France. Vine a fairly vigorous trailing grower and very productive. Flowers self-fertile. Clusters rather large, well filled, and short, with heavy shoulders or wings; peduncle long and stout. Berries medium or above medium in size, round to slightly oval, firm, dull black with abundant bloom; pulp firm; juice dark red. Skin medium thick and medium tough. Sugar 20° to 24.9° Balling; acid 0.67 to 1.89. Ripens midseason. This variety is used almost exclusively for juice. Its productiveness, deep color, and good shipping qualities make it valuable for this purpose. Suggested for district 13.

Black Hamburg.—(Vin.) Origin, Austria. Vine vigorous, erect grower, very productive. Flowers self-fertile. Clusters medium to large, pyramidal, cylindrically tapering, compact; peduncle short to medium length, rather thick. Berry large, globular to slightly oval, purple with bluish bloom, meaty, persistent. Skin thick, fairly tough; pigment red. Flesh juicy, soft. Flavor sweetwater and aromatic when fully ripe. Sugar 20° to 28° Balling; acid 0.64 to 0.73. Ripens midseason. A good all-purpose grape, and adjusts itself to many diversified conditions. Perhaps the best-known vinifera variety. It has been grown more extensively under glass than any other variety. Suggested for districts 10 and 13.

Black Prince.—(Vin.) Origin, unknown. Vine strong, vigorous, very productive. Flowers self-fertile. Clusters very large, tapering regularly and gradually from the shoulder downward, sometimes almost cylindrical. Berries medium in size, ovate, dark purple with heavy bloom, persistent. Skin thick,

fairly tough; pigment light red. Flesh colorless, meaty, fairly firm, juicy. Flavor fruity, sprightly, sweetwater. Ripens in midseason. A good all-purpose grape, a fair shipper, and an excellent red-juice grape. Suggested for district 13.

Carignane.—(Vin.) Origin, Spain. Vine vigorous, upright grower, very productive. Flowers self-fertile. Cluster cylindrical, with inconspicuous shoulder, compact, medium to large; peduncle medium long, light brown, woody. Berries medium sized, almost globular, dark purplish blue with abundant bloom, persistent, medium firm. Skin moderately thick, coarse, somewhat astringent. Flesh colorless, sweet, juicy, medium firm, of excellent quality. Sugar 22½° to 24° Balling; acid 0.80 to 1.29. Ripens medium late; ships fairly well. Makes an excellent red juice and is also a good all-purpose grape. Suggested for district 13.

Cornichon.—(Vin.) Origin, oriental. Vine vigorous, erect, very productive. Flowers self-fertile. Clusters large, branched, loose, with long, strong, but slender pedicels; peduncle light olive green, short, tender. Berries large, ellipsoidal, elongated, somewhat irregular, black with abundant bloom. Skin thick, meaty, tart, tough; pigment dark red. Flesh watery, meaty, firm. Flavor very pleasant and fruity. Sugar 20° to 21° Balling; acid 0.57 to 0.96. Ripens midseason. Excellent for dessert and market, passable for juice purposes. A very handsome grape of uniform-sized clusters, ships and sells well. Suggested for district 13.

Ferrara.—(Vin.) Origin, Spain. Vine vigorous and productive. Flowers self-fertile. Cluster large, conical, elongated, loose; peduncle very long, somewhat woody. Berries large, ellipsoidal, purplish black, of neutral flavor, crisp. Skin thick; pigment light red. Flesh firm, medium juicy; adherence good. Sugar 19° to 23.6° Balling; acid 0.58 to 0.76. Ripens late. Has good storage and shipping qualities. Suggested for district 13.

Grenache.—(Vin.) Origin, Spain. Vine vigorous, productive. Flowers self-fertile. Cluster large, short, compact, almost as broad as long, often heavily shouldered; peduncle large, rather hard, enlarged at cane and near cluster. Berry large, regular in size, oval, slightly flattened, dark blue. Skin medium thick, fairly tough, and contains a fair amount of dark red pigment. Juice fairly abundant, colorless. Sugar 22.5° to 24.8° Balling; acid 0.72 to 0.91. Ripens rather late. Suggested for district 12.

Gros Guillaume.—(Vin.) Origin, France. Vine a vigorous, open grower, productive. Flowers self-fertile. Cluster very uniform and medium in size, fairly loose to compact, cylindrical, ending abruptly, frequently heavily shouldered, peduncle medium in length and thickness, woody, reddish brown. Berry large, globular, sometimes slightly ovate, smooth, purple with blue bloom, dull gloss, firm, persistent. Skin moderately thick, tough, adheres slightly to pulp; pigment red. Flesh meaty, firm, juicy, excellent in quality. Flavor spicy, lively sweetwater; juice grape and excellent for dessert and shipping. Handsome, of good quality. Ripens midseason. Sugar 28° Balling; acid 0.52. A fair and excellent keeper. Suggested for district 13.

Hunisa.—(Vin.) Origin, Syria. United States Department of Agriculture introduction Nos. 6124 (in 1901) and 8583 (in 1902). Vine a vigorous, spreading grower, exceedingly productive. Flowers self-fertile. Cluster very large, long, loose, cylindrical, winged, inclined to have a considerable number of "shot" and undersized berries; peduncle medium size, wiry, olive green. Berry ovate, oblong, large to very large, purple with bluish-white bloom, glossy, firm, persistent, very handsome. Skin thick, tenacious, purple; pigment red. Flesh meaty, firm, coarse grained, moderately juicy, good quality. Flavor sprightly, sweetwater; quality very good. Sugar 21° to 28° Balling; acid 0.52 to 0.77. Ripens late. A remarkably handsome grape of excellent eating, shipping, and storage qualities. Suggested for district 13.

Jura Muscat.—(Vin.) Origin, uncertain. Vine fairly vigorous grower and very productive. Flowers self-fertile. Cluster medium in size, medium compact, tapering, cylindrical. Berry medium to below medium in size, globular, dark purple; adherence good. Skin medium thick and tough. Flesh fairly meaty, firm, medium juicy. Flavor muscat, rich; quality good. Sugar 26.5° to 28.8° Balling; acid 0.64 to 0.71. Ripens medium late. A good all-purpose grape and ships well. Suggested for districts 10 and 13.

Mission.—(Vin.) Origin, unknown. Vine robust, vigorous, very productive. Flowers self-fertile. Cluster medium to large, tapering, loose to fairly compact; peduncle slender, short, yellowish green, brittle. Berry medium size,

globular, firm, black with light-blue bloom, persistent. Flesh soft, medium juicy. Skin rather thick, fairly tough; pigment light red. Flavor natural sweetwater; when fully ripe rich and sweet. Sugar 20.2° to 20.4° Balling; acid 0.46 to 0.75. A fair white or red and sweet juice grape of fair shipping quality. Vinifera grape culture in this country began with this grape. Suggested for districts 10 and 13.

Monukka.—Syn., *Black Monukka.* (Vin.) Origin, Persia(?). United States Department of Agriculture introduction Nos. 26605 and 26606 in 1910. Vine bushy, robust, drooping, dense, very vigorous, very productive. Flowers self-fertile. Clusters large to very large, loose, cylindrical, winged; peduncle light brown, rather long, strong, woody. Berries elongated ovate cylindrical with a tendency to be flattened at apex, grizzly to dark purple in color, blue bloom, dull gloss, persistent, firm. Skin moderately thin, tough, adheres to pulp. Flesh not melting, tender, juicy, firm, of excellent quality. Flavor rich, fruity, pleasant sweetwater. Practically seedless with occasional undeveloped seeds. Sugar 26° to 30° Balling; acid 0.49 to 0.59. Ripens early. Ships fairly well, its main defect being weak pedicels, which cause berries to drop if roughly handled. Makes an excellent raisin and is a fine eating grape of superior dessert quality. Also makes a good red juice. Suggested for district 13.

Muscat Hamburg.—(Vin.) Origin, probably England. Vine vigorous and productive. Flowers self-fertile. Cluster of medium size, loose, conical, long. Berry oblong, medium to above medium in size, purplish black. Adherence good. Skin medium thin but tough. Flesh fairly meaty, rather soft, juicy. Flavor muscat, vinous, rich; quality very good. Sugar 22.7° to 27° Balling; acid 0.55 to 0.71. Ripens midseason. An all-purpose grape of excellent quality. Very popular in the grapery and excellent for outdoor culture. Suggested for districts 10 and 13.

Petit Syrah.—(Vin.) Origin, French Alps. Vine a vigorous, spreading grower, very productive. Flowers self-fertile. Cluster cylindroconical in shape with shoulders or winged, medium to above medium in size, compact, black; peduncle long, rather thick, herbaceous. Berry medium and of even size, irregular in shape but somewhat elongated, black with light bloom, persistent. Skin medium thin, tough; pigment dark red. Flesh rather soft, colorless, juicy, and excellent in quality. Flavor spicy, sprightly, and rich. Sugar 18° to 25.5° Balling; acid 0.65 to 1.28. Ripens midseason. It is essentially a juicy grape, making a superior red juice. Suggested for district 13.

Prune de Cazouls.—(Vin.) Origin, France. Introduced by the United States Department of Agriculture in 1905. Vine very vigorous and very productive. Clusters uniform, medium to large, wide, intermediate in length, tapering, sometimes single shouldered, medium loose to well filled; peduncle medium short, thick, woody. Berries medium to large, slightly oblong, black covered with bluish bloom, slightly glossy, firm, persistent. Skin rather thick, medium tough, slightly adherent to pulp; pigment wine colored. Flesh pearly, juicy, fine grained, meaty, good in quality. Flavor sprightly, fruity, rich. Sugar 22° to 26° Balling; acid 0.43 to 0.82. Ripens midseason. An exceptionally handsome fine table, shipping, and storage grape. Ships, carries, and keeps well. Suggested for district 13.

Zinfandel.—(Vin.) Origin, Hungary. Vine an erect, stocky, spreading grower. Very productive. Flowers self-fertile. Clusters medium to above medium, quite full, usually heavily shouldered; peduncle medium size, woody, stocky. Berry round, medium to above medium in size, five-eighths inch in diameter, surface smooth. Skin thin, moderately tender, dark purple with heavy light bloom; pigment red. Flesh white, meaty, firm, very juicy. Flavor vinous, fruity, and spicy. Sugar 19.5° to 25° Balling; acid 0.75 to 1.11. Ripens midseason. A good eating and excellent juice grape. It has been and still is the most extensively grown vinifera red-juice grape. Suggested for districts 10 and 13.

AMERICAN EUVITIS TYPE

The cultural properties of the American indigenous grape species from which improved varieties have been developed or which have been hybridized to produce varieties now grown to some extent in the United States are given in Table 1. Knowing the characteristics of these native species and their habitat is helpful in determining the

adaptability of varieties derived from them. In the following descriptions of varieties the abbreviations[3] following the varietal names show the parentage of the variety. Where known, the State and the year in which the variety was originated or discovered are stated, as well as the purposes for which the varieties are best suited and the districts to which they are best adapted.

Their parentage and the native environments under which the parent species thrive are all-important in determining the adaptability of American native grape varieties. Some cold-resistant species persist in the more northern States; others are heat resistant; still others thrive under subtropical environments or where various intermediate conditions are found.

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[3] The abbreviations used for species of Vitis are as follows: Aest., *aestivalis;* Berl., *berlandieri;* Bl., *bicolor;* Bourq., *bourquiniana;* Cand., *candicans;* Champ., *champini;* Cl., *cinerea;* Cord., *cordifolia;* Doan., *doaniana;* Lab., *labrusca;* Linc., *linsecomi;* Sol., *solonis;* Mont., *monticola;* Rip., *riparia;* Rot., *rotundifolia;* Rup., *rupestris;* Vin., *vinifera.*

TABLE 1.—*Cultural properties of grape species used in American viticulture*

Name and region of nativity	Preferred location	Vine	Roots	Seasons of leafing, flowering, and ripening	Percentages of cuttings taking root	Grafting adaptation[1]	Resistance to—[1]				
							Phylloxera (out of a possible 10)	Cold	Dampness	Heat	Drought
Vitis aestivalis (summer grape): Southern New York to Florida westward to the Mississippi and Missouri Rivers.	Rich, warm, gravelly moist soils.	Vigorous, medium-sized climbers.	Slightly fibrous, rather large, hard, penetrating.	Medium late	50	F	14	VG	....	G	G
V. berlandieri (little mountain grape): Texas and New Mexico.	Tops, sides, and bottoms of limestone hills.	Slender, medium grower.	Slightly branching, strong, hard, plunging.	Late	40	F	19	F	....	G	G
V. bicolor (blue grape): Ontario, Wisconsin, Illinois, Indiana, Ohio, northern Kentucky, western New York and Pennsylvania, New Jersey, Maryland, and northern Virginia.	Black sand and tel siliceous soils.	Fair grower	Fibrous, wiry, rather hard, large, plunging.	do	40	F	16	VG	....	G	G
V. candicans (mustang grape): Oklahoma, Texas, western Louisiana into Mexico.	Black waxy lands or adobe.	Moderately vigorous, medium climber.	Vigorous, firm, deeply penetrating.	Medium early	30	F	15	F	F	G	G
V. champini (adobe land grape): Texas	Limestone hills; adapts itself to a variety of soils.	Vigorous, spreading grower.	Large, ramified, soft, plunging.	Early to medium.	90	FB	12	F	G	G	G
V. cinerea (sweet winter or ashy grape): Illinois to Texas.	Deep, rich, loose soils on river banks.	Vigorous, strong grower.	Large, fleshy, deeply penetrating.	Very late	25	F	15	F	G	....	....
V. cordifolia (frost or sour winter grape): Great Lakes to Florida, abundant in Illinois, Tennessee, Missouri, and Arkansas.	do	Vigorous, strong climber.	Strong, hard, sarmentous, deeply penetrating.	Late	25	F	18	VG	F	G	G
V. doniana (Texas Panhandle large grape): Oklahoma, Panhandle of Texas, New Mexico.	Sandy limy soils	Slender, fair grower	Fibrous, hard, deeply penetrating.	....	60	F	12	F	G	G	....
V. labrusca (northern fox grape): Alleghany Mountains from New England to South Carolina, Georgia, central Tennessee, southern Indiana.	Wet thickets, gravelly soils.	Vigorous, medium-sized climber.	Spreading, rather large, soft, and fleshy; penetrating moderately.	Very late	85	BF	5	VG	....	F	F
V. linsecomi (post oak or turkey grape): Texas, eastern Louisiana, Oklahoma, Arkansas, and southwest Missouri.	High, well-drained timberlands, granitic, gravelly, clay, compact, deep, rich river-bank soils.	Vigorous, good-sized climber.	Large, slightly fibrous, fleshy, firm, deeply penetrating.	Medium late	40	F	14	F	....	G	G
V. longi (Solonis, bush, or gulch grape): Texas Panhandle, New Mexico, Arkansas, and Colorado.	Ravines along streams; cretaceous, generally rich sandy moist always fresh soils.	Bushy, upright, vigorous grower.	Large, slender, ramified, hard, deeply penetrating.	Early	60	F	14	F	G	G	G

V. monticola (sweet mountain grape): Texas	Low limestone hills; does moderately well in sandy soil.	Rather small; good grower.	Bushy, somewhat thick, firm, deeply penetrating.	Medium late	65	Fb	18	F	----	G	G
V. rotundifolia (southern muscadine): Gulf and Atlantic States from Potomac River to central Florida, through Georgia, south Tennessee, Alabama, Mississippi, Arkansas, Louisiana, and eastern Texas.	Moist, shady places in well-drained, high bottom lands.	Slender, high climber.	Thick, slightly branched, wrinkled transversely pendulating, spreading near the surface.	Very late	10	----	20	F	F	G	G
V. rupestris (sand, sugar, or rock grape): From the Rio Grande in Texas northeasterly into Oklahoma, northwestern Arkansas, southern Missouri, Kentucky, and Tennessee, Cumberland Mountains north to Pennsylvania.	Open places in poor soils and along gravelly banks and ravines.	Vigorous, short, bushy grower.	Long, slender, hard, wiry, rather pendulating.	Very early	80	B	19	G	----	G	G
V. vulpina (riparia or riverside grape): From Salt Lake east and from Texas north in all the States as far as 90 miles north of Quebec.	Moist, loose, sandy soils along creeks and river bottoms.	Vigorous, medium-sized.	Long, thin, slender, hard, wiry, ramified, spreading near tips.	do	85	Fb	19	Vg	G	----	----
V. vinifera (exotic species): Finds congenial conditions in the various grape countries of the Old World.	Some varieties suited to each of the important vineyard soils.	Medium to strong grower, slender to very bushy and stocky.	Varies greatly with the various varieties.	Early to late	90	----	----	F	F	G	G

[1] Abbreviations used in this table: Under "Grafting," B for bench, F for field; under "Resistance," F for fair, G for good, and V for very resistant.

WHITE VARIETIES

Diamond.—(Lab., Vin.) Origin, New York, about 1870. Vine medium grower, fairly productive in nearly all locations, usually hardy as far north as latitude 42° N. Flowers self-fertile. Cluster medium to short, rather broad, somewhat blunt, cylindrical to slightly tapering, often single-shouldered, compact; peduncle short to medium, moderately thick. Berries medium to above medium in size, globular to strongly ovate on account of compactness; color green with yellow tinge covered with gray bloom; persistent, rather firm. Skin thin, rather tough, adheres to the pulp, contains no pigment, astringent. Flesh pale green, rather translucent, juicy, tender, melting, fine grained, slightly aromatic, sprightly, nearly sweet next to skin to agreeably tart at center; quality very good. Sugar 16.7° Balling; acid 0.79. Ripens medium early. A good all-purpose grape. Suggested for districts 2, 3, 4, 6, 7, 8, 11, and 12.

Elvira.—(Rip., Lab.) Origin, Missouri, 1863. Vine vigorous, hardy, healthy, exceedingly productive. Flowers self-fertile or nearly so. Cluster intermediate in size, above medium to short, of average breadth, cylindrical, usually single-shouldered, compact; peduncle short to medium, rather thick. Berries medium size, globular to slightly oblate, often misshapen on account of compactness, greenish with yellow tinge, rather dull, bloom gray, not always persistent, rather firm. Skin very thin, tender, adheres slightly to pulp, contains no pigment, somewhat astringent. Flesh greenish, juicy, fine grained, tender, slightly foxy, sweet, not acid at center, somewhat flat in flavor, of fair quality. Sugar 11.7° Balling; acid 1.04. One of the most profitable white-juice varieties. Suggested for districts 3, 4, 6, 7, and 8.

Empire State.—(Rip., Lab., Vin.) Origin, New York, about 1875. Vine a fair grower, usually healthy in most localities, somewhat tender, moderate to productive yielder. Flowers self-fertile. Cluster large to below medium, long, rather slender, cylindrical to slightly tapering, frequently single-shouldered, medium to compact; peduncle variable, often characteristically long, rather thick. Berries variable in size, averaging medium to below medium, inclined to globular, pale yellow green, gray bloom, persistent, moderately firm. Skin medium to thick, variable in toughness, adheres but slightly to pulp, contains no pigment, with slight astringency. Flesh pale yellowish green, translucent, very juicy, fine grained, rather tender, sweet next to skin but somewhat acid near center, agreeably flavored, very good in quality. Sugar 16.62° Balling; acid 0.38. Ripens midseason to late. Very much esteemed as a table grape, and in great demand for juice making. Suggested for districts 2, 3, 4, 6, and 7.

Gold Coin.—(Aest., Lab.) Origin, Texas, 1883. Vine fairly vigorous, productive, hardy as far north as latitude 43°. Flowers nearly fertile. Cluster medium to small, not very long, usually single-shouldered, variable in compactness. Berries large to below medium, globular to slightly oval, yellowish green, with a distinct trace of reddish amber, gray bloom, usually persistent. Skin covered with small scattering brown dots, thin, inclined to toughness. Flesh somewhat tough, faintly aromatic, tart from skin to center, good in quality. Sugar 15.5° Balling; acid 0.43. Fruit ripens in midseason, keeps long in good condition, and also makes an excellent white juice. Suggested for districts 4, 5, and 9.

Hidalgo.—(Vin., Lab., Bourq.) Origin, Texas, about 1895. Vine variable in vigor, not always hardy, somewhat uncertain in bearing. Flowers semifertile. Cluster large, long to medium, inclined to slender, cylindrical to slightly tapering, often blunt, sometimes shouldered, medium to compact; peduncle long and slender. Berries above medium size, inclined to oval, attractive greenish yellow, rather glossy gray bloom, persistent, firm. Skin thin to medium, tough, adheres slightly to the pulp, contains no pigment, astringent. Flesh greenish white, somewhat translucent, juicy, tender and melting, aromatic, sweet from skin to center, quality excellent; one of the best. Ripens midseason. Excellent for table and market and a good juice grape. Suggested for districts 3, 5, 6, and 9.

Krause.—(Bourq., Lab., Vin.) Origin, Texas, 1893. Vine vigorous, slightly attacked by mildew in damp seasons. Flowers self-fertile. Cluster large, shouldered, medium to short, rather broad, cylindrical to slightly tapering, medium loose; peduncle medium in size and thickness. Berries large, globular, pearly white, handsome; skin thin, pulp tender, melting, of excellent quality. Ripens midseason. Sugar 14.1° Balling; acid 0.80. A valuable market and

table grape for the South, and northerly to Kansas and Kentucky. Suggested for districts 5, 6, and 9.

Niagara.—(Lab., Vin.) Origin, New York, 1868. Vine vigorous to medium, not hardy in extremely cold winters, irregularly productive. Flowers self-fertile. Cluster large to medium, long to medium, somewhat broad, tapering to often cylindrical, often single-shouldered, moderately compact; peduncle short to medium, thick. Berries above medium to large, slightly oval, light green changing to yellowish-green tinge, gray bloom, persistent, firm. Skin thin, tender, adheres somewhat to pulp, contains no pigment, slightly astringent. Flesh light green, translucent, juicy, fine grained, moderately tender, foxy, sweet next to skin to agreeably tart at center. Fair in quality. Sugar 16.1° Balling; acid 0.61. Ripens midseason to late. A good all-purpose grape. Suggested for districts 2, 3, 4, 5, 6, 7, 8, 11, and 12.

Rommel.—(Lab., Rip., Vin.) Origin, Texas, 1885. Vine medium to vigorous, not always hardy, medium to productive. Flowers semifertile, stamens upright. Cluster variable in size, above medium to short, moderately broad, cylindrical to slightly tapering, usually single-shouldered, compact to medium; peduncle long to medium, thick. Berries large to medium, oblate to globular, frequently compressed on account of compactness of cluster, light green with yellow tinge, covered with gray bloom, persistent, firm, breaking easily under pressure. Skin thin, cracks badly, medium to tender, adheres to pulp, contains no pigment, without astringency. Flesh greenish, translucent, juicy, tender, and melting, slightly stringy, sweet to agreeably tart at center; variable in quality, but usually very good. Sugar 16.2° Balling; acid 0.97. Ripens in midseason; ships and keeps fairly well. A good all-purpose and excellent white-juice grape. Suggested for districts 3, 4, 6, and 9.

Wapanuka.—(Lab., Rip., Vin., Bourq.) Origin, Texas, 1893. Vine medium to strong, usually hardy, productive. Flowers fertile or nearly so. Cluster intermediate in size, long to medium, cylindrical, frequently with a long peduncle, single shoulder, compact. Berries large, globular, rich yellowish white, gray bloom, translucent, soft, with tendency to shatter. Skin covered with few small dark dots, very thin and tender. Flesh usually pale green, tender, somewhat foxy, sweet, and mild, seldom cracks, very good in quality. Ripens medium early to midseason. Sugar 14.5° Balling; acid 0.45. Excellent for table and near-by markets and a good juice grape. Suggested for districts 3, 4, 5, and 9.

Winchell.—(Lab., Vin., Aest.) Origin, Vermont, about 1860. Vine vigorous, hardy, healthy, very productive. Flowers fertile, stamens upright. Cluster large to below medium, long, slender, cylindrical to slightly tapering, often with a long single shoulder, loose to moderately compact; peduncle long, moderately slender. Berries above medium to small, globular, light green, thin white bloom, usually persistent, soft. Skin often marked with small reddish-brown spots, thin, tender, adheres slightly to pulp, contains no pigment, slightly astringent. Flesh greenish, translucent, juicy, tender, fine grained, sweet, very good to best in quality. Sugar 20.4° Balling; acid 0.66. The best all-purpose, very early white grape and an excellent juice grape. Suggested for districts 2, 3, 4, 6, 7, 8, 11, and 12.

RED VARIETIES

Agawam.—(Lab., Vin.) Origin, Massachusetts, about 1855. Vine vigorous, usually hardy, medium to productive. Flowers nearly self-fertile. Cluster variable, averaging medium to large, short, rather broad, tapering to somewhat cylindrical, sometimes single-shouldered, somewhat loose; peduncle medium to short, fairly thick. Berries fairly large, globular to slightly oval, dark and dull purplish red, covered with lilac bloom, very persistent. Skin tough, thick, adheres slightly to the pulp, contains very little pigment, somewhat astringent. Flesh pale green, translucent, tough, slightly stringy, rather solid, foxy, good in quality. Ripens medium to medium late. An excellent all-around grape. The qualities recommending it are its large size of bunch and berry, rich, sweet, aromatic flavor, attractive appearance, excellent shipping and keeping qualities. Sugar 18.1° Balling; acid 0.86. Suggested for districts 3, 4, 6, 8, and 12.

Brighton.—(Lab., Vin.) Origin, New York, about 1870. Vine vigorous, hardy, usually producing fair crops. Flowers sterile; stamens reflexed. Cluster very large to medium, usually long, broadish, tapering, often heavily shouldered, loose to compact; peduncle quite long. Berries irregular, medium to large in size, globular to slightly oval, light and dark red, somewhat glossy, dark lilac

bloom, handsome, persistent, not firm. Skin thickish, very tender, adheres considerably to pulp, contains no pigment, astringent. Flesh greenish, very good in quality. Ripens early to midseason. Sugar 20.1° Balling; acid 0.68. Brighton is usually included in collections and ranks as one of the amateur northern grapes. Not being self-fertile, it should be interplanted with pollenizers. Suggested for districts 2, 3, 4, 6, 7, 11, and 12.

Brilliant.—(Lab., Vin., Bourq.) Origin, Texas, 1883. Vine variable in growth, averaging vigorous, hardy up to 15° F. below zero, usually productive. Flowers self-fertile. Cluster large, cylindrical, or somewhat conical, often shouldered, open to compact. Berries large, globular, light to dark red, translucent, glossy, with abundant lilac bloom, adheres strongly to pedicel, firm. Skin rather thin and tough, adheres considerably to pulp, contains no pigment, slightly astringent. Flesh pale green, rather translucent, juicy, slightly stringy, very tender, melting, and delicious. Ripens medium early to midseason. Sugar 18.7° Balling, acid 0.69. Endures heat and drought fairly well. Adapted to South and North. Hardy up to 34° N. latitude. Suggested for districts 3, 4, 6, and 7.

Captivator.—(Lab., Vin., Bourq.) Origin, Texas, 1902. Vine of good vigorous growth, usually productive. Flowers self-fertile. Clusters large, cylindrical, sometimes shouldered, properly compact. Berries persistent, large to very large, globular, clear, lively, translucent red; skin thin, tough; pulp tender, melting, sweet, and of delicious quality. Sugar 18.7° Balling; acid, 0.70. Ripens medium early to medium. A good all-purpose grape. Exceedingly attractive. Splendid for table and juice. Suggested for districts 5 and 9.

Catawba.—(Lab., Vin.) Origin, unknown. Introduced from Maryland into the District of Columbia by John Adlum about 1823. Vine vigorous to medium, hardy, productive. Flowers fertile. Cluster large to medium, rather long, usually broad, nearly cylindrical to tapering, single to sometimes double-shouldered, rather loose to compact; peduncle average length, rather slender. Berries intermediate in size, oval to globular, dull purplish red, with lilac bloom, persistent, firm. Skin rather thick, variable in toughness, slightly adheres to pulp, with no pigment, somewhat astringent. Flesh green, translucent, juicy, fine grained, slightly tough to soft. Sugar 19.8° Balling; acid 0.93. Ripens late. An excellent all-purpose grape and one of the most interesting American varieties. A good shipping and keeping and an excellent juice grape. Suggested for districts 3 and 6.

Delaware.—(Lab., Bourq., Vin.) Origin probably New Jersey about 1830. Vine not a strong grower, hardy except in unfavorable locations, productive. Flowers, self-fertile. Clusters medium to small, average length, slender, rather blunt, often cylindrical, regular, usually shouldered, compact; peduncle, medium to short, slender. Berries uniform in size and shape, small to medium, globular, light red, covered with lilac bloom, persistent, firm. Skin thin, moderately tough, adheres slightly to pulp, contains no pigment, slightly astringent. Flesh light green, translucent, juicy, tender, aromatic, vinous, sprightly, and refreshing, sweet to agreeably tart from skin to center, best in quality. Ripens medium early to midseason. Sugar 21.3° Balling; acid, 0.73. Delaware is of choicest quality and next to Concord is the most popular grape for garden and vineyard grown in the United States. Suggested for districts 2, 3, 4, 6, 7, 8, 9, 11, and 12.

Ellen Scott.—(Linc., Lab., Vin.) Origin, Texas, 1902. Vine hardy from latitude 34° to 38° N. and longitude 98° E.; stocky, vigorous, productive. Flowers self-fertile. Cluster very large, conical, often shouldered; peduncle short. Berry very persistent, globular, medium to large, dark, translucent, violet. Skin thin but does not crack, delicate. Flesh breaking, melting, of most sprightly delicious character. Sugar 18.7° Balling; acid 0.95. Ripens late. A very handsome table and market grape; should also make a very good juice. Suggested for districts 5 and 9.

Goethe.—(Lab., Vin.) Origin, Massachusetts, about 1855. Vine of medium vigor, hardy, variable in productiveness. Flowers partly fertile. Cluster intermediate in size, short to medium, rather broad, widely tapering, often single-shouldered, intermediate in compactness; peduncle rather short, of average thickness. Berries very large to above medium, oval to nearly globular, pale red, with thin gray or slightly lilac bloom, rather firm, persistent. Skin thin, tender to medium, adheres slightly to the pulp, contains no pigment, faintly astringent. Flesh pale green, translucent, inclined to tenderness, rather coarse, nearly sweet at skin but decidedly tart at center, with some vinifera sprightliness. Of very good quality in many northern localities. Sugar 17.4° Balling;

acid 1.13. A splendid table and market grape. Keeps well and is excellent for juice. Suggested for districts 3 and 6.

Goff.—(Lab., Vin., Aest.) Origin, New York, about 1890. Vine vigorous, hardy, productive. Flowers self-fertile. Clusters variable in size, long to medium, frequently very slender, cylindrical surface, often irregular with a blunt end larger than the part above, sometimes shouldered with a small single shoulder, compact; peduncle usually short, intermediate in thickness. Berries variable in size, medium to above medium, often misshapen, strongly flattened, not uniform, dark reddish purple, with lilac bloom, firm, persistent. Skin thick, medium tough, adheres slightly to pulp, pigment bright red, slightly astringent. Flesh pale green, translucent, juicy, tender, a little coarse, somewhat vinous, sweet from skin to center, good in quality. Sugar 16° Balling; acid 0.61. Ripens late. An excellent keeper, good all-purpose grape. Suggested for districts 2, 3, 6, 7, 8, and 11.

Headlight.—(Vin., Lab., Bourq.) Origin, Texas, 1895. Vine of medium vigor, hardy, very productive. Flowers sterile, stamens reflexed. Clusters small to medium, average breadth, very compact, shouldered, tapering; peduncle short to medium, slender. Berries medium to above medium, globular, clear, dark red with light-blue bloom, firm, persistent. Skin thin, tough, adheres to the pulp, contains some light-red pigment, astringent. Flesh greenish, translucent, juicy, fine grained, vinous, sweet; quality very good. Sugar 16.6° Balling; acid 0.45. Ripens very early. Valuable as an extra-early market and table grape, of high quality and good keeper. Suggested for district 4.

Last Rose.—(Linc., Vin., Lab.) Origin, Texas. Vine vigorous, healthy, productive. Clusters very large, compact, long, conical with heavy shoulder. Berries medium to large, dark shiny red, round. Pulp tender, of very good quality. Ripening very late. A very handsome market grape. Suggested for districts 4, 5, and 9.

Lucile.—(Lab.) Origin, New York, 1888. Vine vigorous, hardy, very productive. Flowers self-fertile. Clusters medium to above medium, rather long and slender, cylindrical to tapering, often single-shouldered, very compact; peduncle large, intermediate in length. Berries large to medium, globular to slightly oval when decidedly compacted, dark dull red, with lilac bloom, firm, persistent. Skin medium to thin, somewhat tender, contains some light-red pigment and some astringency. Flesh pale green, translucent, juicy, rather tough, sometimes stringy, foxy, sweet next to the skin to slightly tart at center, fair to good in quality. Fruit ripens medium early. Sugar 15.5° Balling; acid 0.83. Fruit keeps well. Although of not more than medium quality, this variety can be recommended for its superior hardiness, good productiveness, and thriftiness in all good grape soils. Suggested for districts 2, 3, 4, 6, 7, and 8.

Valhallah.—(Lab., Caud., Rip., Vin., Bourq.) Origin, Texas, about 1902. Vine vigorous, drought resisting, prolific. Flowers self-fertile. Cluster medium size, shouldered. Berries large, dark, translucent red, globular, skin thin, tough; pulp juicy, tender, of very good quality. Ripens medium late to late. Sugar 16.5° Balling; acid 0.85. Keeps well on the vine. Adapted on Gulf plains 100 miles wide and in western Texas, New Mexico, and Oklahoma. Useful for table, market, and juice. Suggested for districts 5 and 9.

Vergennes.—(Lab.) Origin, Vermont, about 1870. Vine variable in vigor, not always hardy, medium to very productive, depending upon amount of winter injury, usually healthy. Flowers nearly sterile. Clusters intermediate in size and length, broad, cylindrical to tapering, occasionally single-shouldered, inclined to be loose; peduncle short to medium, thick. Berries large to below medium, oval to globular, light and dark red, lilac bloom, firm, persistent. Skin does not crack, thick, tough, adheres considerably to the pulp, contains no pigment, astringent. Flesh pale green, juicy, fine grained, somewhat stringy, tender, vinous, sweet next to the skin, agreeably tart at center, good to very good in quality. Keeps and ships well. Ripens late to medium late. Sugar 17.8° Balling; acid 0.74. Recommended for its intrinsic value, late ripening, and regular bearing. Suggested for districts 2, 6, 7, and 8.

BLACK VARIETIES

Alpha.—(Rip. ×.) Origin, Minnesota; found wild in 1901. Vine vigorous and prolific, very hardy and resistant to mildew. Cluster large, rather long, cylindrically tapering. Berries medium to below medium in size, globular, bluish black, fairly sweet, vinous. Ripens early. Good for preserves, jelly, and native juice for family use. Suggested for district 1.

Bailey.—(Linc., Lab., Vin.) Origin, Texas, 1887. Vine vigorous, not always hardy, productive. Flowers self-fertile. Clusters rather large, long, not broad, often blunt at ends, cylindrical to irregularly tapering, sometimes small, short-shouldered, compact. Berries persistent, medium to large, globular to ovate on account of compactness; color purplish black to black, heavy blue bloom. Skin medium thin, astringent, tough, adheres somewhat to pulp; pigment purplish red. Flesh moderately juicy and tender, coarse, vinous, of good quality, seeds parting readily. Ripens late. Sugar 19.04° Balling; acid 0.89. Good for local markets and for juice purposes. Suggested for districts 5 and 9.

Beacon.—(Linc., Lab.) Origin, Texas, 1887. Vine vigorous, not always hardy, very productive. Flowers nearly self-fertile. Clusters attractive, good size, rather long, medium to slightly slender, cylindrical to somewhat tapering, usually single-shouldered, compact. Berries medium but variable in size, globular, purplish black to black, dull in appearance, blue bloom, inclined to shell in some localities, moderately firm. Skin medium to thin, tough, adheres strongly to pulp; pigment purplish red, astringent. Flesh moderately tender, slightly aromatic, spicy, vinous, mildly subacid to agreeably tart. Ripens medium late. Sugar 17° Balling; acid 1.05. A good all-purpose grape. Suggested for districts 5 and 9.

Beta.—(Lab., Rip.) Origin, Minnesota. Vine vigorous, very hardy, and productive. Flowers self-fertile. Cluster small to medium size, compact, cylindrical, often shouldered. Berries medium to below medium in size, globular, black, light blue bloom, fairly sweet, vinous. Ripens early. Sugar 17° Balling; acid 1.17. Good for preserves, jelly, and juice. Suggested for district 1.

Campbell Early.—(Lab., Vin.) Origin, Ohio, about 1888. Vine fairly vigorous, hardy, productive, but rather sensitive as to soils. Flowers self-fertile. Clusters range from medium to large in size, rather long and broad, tapering to cylindrical, often single-shouldered, compact to slightly loose. Berries somewhat variable in size, usually large, globular to slightly oval, dark purplish black, rather dull as the season advances, heavy blue bloom, firm, persistent. Skin medium to thin, tough, does not crack, adheres slightly to pulp, contains small amount of dark-red pigment, astringent. Flesh greenish, translucent, juicy, varying from rather tough to nearly soft, slightly coarse, not foxy, somewhat vinous, nearly sweet from skin to tart at center; quality good. Ripens medium early and fruit keeps well on the vines. Sugar 17.2° Balling; acid 0.79. Of good shipping and keeping qualities. Suggested for districts 2, 3, 6, and 7.

Carman.—(Linc., Vin., Lab.) Origin, Texas, about 1888. Vine usually vigorous, hardy, varies in productiveness. Flowers fertile or nearly so. Clusters variable in size, of average length and breadth, tapering to cylindrical, often single-shouldered, usually compact; peduncle above medium length and thickness. Berries inferior in size, globular to slightly oblate, dark purplish black to black, glossy, blue bloom, firm, persistent. Skin rather thin, tough, nearly free from pulp, contains little or no pigment, not astringent. Flesh yellowish green, not juicy, somewhat tender when fully ripe, has some post-oak flavor, vinous, spicy, sweetish at skin to tart next the seeds, quality good. Sugar 17.3° Balling; acid 0.45. Ripens late, keeps well on vines and after harvesting. Too late for most northern locations. Well regarded in many sections of the South to as far north as latitude 40° N. Suggested for districts 3, 4, 5, and 9.

Cloeta.—(Linc., Rup., Lab., Vin.) Origin, Texas, about 1885. Vine very vigorous, hardy, fairly to very productive. Flowers self-fertile. Cluster large, long, cylindrical, frequently single-shouldered, intermediate in compactness. Berries medium to large, globular, black, blue bloom, persistent, firm. Skin thin, handles well; pulp tender, juicy, sprightly flavor; quality good. Ripens late. Sugar 14° Balling; acid 1.08. Used for market, table, and red juice. Requires hot, dry weather to acquire high quality. Adapted to Gulf plains 100 miles wide, western Texas, New Mexico, Oklahoma, Kansas, Nebraska. Suggested for districts 5 and 9.

Concord.—(Lab.) Origin, Massachusetts, 1843. Vine vigorous to very vigorous, hardy, healthy, usually productive of heavy crops. Although it succeeds on a great variety of soils, it really requires rich soil and thrives best on virgin soils. Flowers self-fertile. Cluster rather uniform, medium to large, intermediate in length, wide and broadly tapering, usually single-shouldered, sometimes double-shouldered, medium to rather compact; peduncle short to medium thick. Berries medium to large globular, slightly glossy, black, abundant blue bloom, not always persistent, firm. Skin average thickness, moderately tough,

slightly adherent to pulp, contains a small amount of wine-colored pigment, somewhat astringent. Flesh pale green, translucent, juicy, rather fine grained, somewhat tough and solid, slightly foxy, sweet at skin, inclined to tartness next the seeds, good in quality. Sugar 17.9° Balling; acid 0.94. Ripens medium late. Widely used as juice grape. The most widely grown grape of this continent, due to its ability to adapt itself to different conditions and to withstand insects and diseases, its fruitfulness, hardiness, comparative earliness, which insures its maturing in northern sections, the fair size of its bunch and berry, and its attractive cluster. Among its faults are: Mediocrity in quality; lack of richness, delicacy of flavor, and aroma; great foxiness, objectionable to many; large and abundant seeds that are difficult to separate from the flesh; tough, astringent skin, inclined to crack; berries inclined to shell from stem after picking; rapid loss of flavor after ripening; does not ship and keep as well as many other varieties; and being essentially a northern grape, when grown in the South becomes susceptible to fungi and ripens unevenly. Suggested for districts 2, 3, 6, 7, and 8.

Cynthiana.—(Aest. × Lab.) Origin, Arkansas, about 1850. Vine vigorous, healthy, hardy to latitude 41° N., usually a good yielder. It prefers sandy or gravelly loams and does not thrive on clay or limestone soils. Clusters medium to small, rather long, intermediate in breadth, tapering to cylindrical; not very uniform, often single-shouldered, compact; peduncle above medium length, small. Berries small, globular, black, blue bloom, persistent, firm. Skin thin, tough, rather adherent to pulp, pigment purple, astringent. Flesh dark green, translucent, juicy, tough and solid, spicy, rather tart; not a dessert grape, but excellent in quality for red juice. Sugar 22.8° Balling; acid 1.40. Ripens late. The juice is perhaps the best of all red juices produced from American grapes. Suggested for districts 3, 4, and 6.

Dakota.—(Lab., Rip.) Origin, Minnesota. A good eye grower, hardy, productive. Cluster medium in size, compact, cylindrical, often shouldered. Berries averaging medium size, globular, black, blue bloom, fairly sweet, good quality. Sugar 11.3° Balling; acid 1.45. Ripens early. Good for preserves, jelly, and juice. Suggested for district 1.

Fern Munson.—(Linc., Vin., Lab.) Origin, Texas, 1885. Vine vigorous, not hardy north of latitude 40° N., productive. Flowers semifertile, clusters medium to large, not very long, variable in width, irregularly tapering, rather cylindrical, usually single-shouldered, variable in compactness, with occasionally abortive fruits. Berries medium to large, globular to slightly flattened, dark purplish black, rather glossy, thin blue bloom, strongly persistent, firm. Skin thin, tough, wine-colored pigment, rather astringent. Flesh juicy, tough, and solid, becoming tender on maturity, fine grained, vinous, briskly subacid to acid, of good quality when thoroughly ripened. Sugar 18.5° Balling; acid 0.90. Ripens quite late. Has endured 27° F. below zero, and resists drought remarkably well. Suggested for districts 4, 6, and 8.

Herbemont.—(Bourq.) Origin, unknown. Vine vigorous to very vigorous, productive. Flowers self-fertile. Clusters large, long, tapering to cylindrical, prominently shouldered, compact, peduncle long and strong. Berries globular, below medium in size, uniform, reddish black, blue bloom. Skin thin, tough, with considerable pigment. Flesh tender, very juicy, rather sweet, sprightly to slightly acid, very good in quality. Ripens late. A good local-market and juice grape. Sugar 19.9° Balling; acid 1.00. Suggested for districts 4, 5, and 9.

Hernito.—(Lab., Vin.) Origin, Texas, 1900. Vine vigorous, liable to injury in the North in severe winters; productive. Flowers nearly self-fertile. Cluster medium to large, rather short, broad, fairly compact, occasionally shouldered; peduncle medium to short. Berries uneven in size, averaging above medium, globular to oblate, mostly oblate, moderately firm, persistent. Skin medium thick, tough, purplish black, blue bloom; pigment wine colored, astringent. Flesh dark green, separating from the seeds fairly easily, but rather tough; pulp moderately juicy, sprightly, mildly subacid, pleasing. Sugar 14° Balling; acid 0.75. Ripens late. One of the best varieties for storing after maturity, keeping well in both cellar and cold storage. A good all-purpose grape. Suggested for districts 3, 4, 6, and 7.

Hubbard.—(Lab., Vin.) Origin, Arkansas about 1908. Vine medium to vigorous, hardy up to latitude 42° N., very productive. Flowers self-fertile. Clusters medium to above medium in size, average 6 inches long and 4 inches broad, regularly tapering, fairly compact; peduncle about seven-eighths of an inch long, medium size. Berries above medium to large, globular, dark purplish black,

blue bloom, persistent, firm. Skin thin, tough, pigment wine colored, astringent. Flesh light green, medium firm, juicy, translucent, tender, fine grained, fruity, rich, vinous; quality very good. Sugar 14° Balling; acid 0.85. Ripens medium early; appears to shell badly after picking, and for this reason it has not taken better with the trade. Suggested for districts 3, 4, and 6.

Hungarian.—Origin, Minnesota, about 1900. Vine vigorous, very productive. Cluster fairly large, compact, cylindrical. Berries black, medium size, sweet, pleasant flavor, good quality. Ripens very early. Although not so hardy as some of the other varieties it is considered promising for extreme northern conditions. Good for household uses and juice. Suggested for district 1.

Husmann.—(Linc., Vin., Lab.) Origin, Texas, 1892. Vine vigorous, prolific, successful on the Gulf plain and north to latitude 34° N. Flowers self-fertile. Cluster very large, long, cylindrical, sometimes shouldered, compact; peduncle medium. Berries medium size, globular, black, persistent. Skin thin, delicate yet tough, pigment wine colored; pulp melting, very juicy, sprightly, of high, pure flavor. Sugar 20° Balling; acid 0.81. Ripens medium late. A good market and table and an excellent red-juice grape. Suggested for districts 3, 6, and 9.

Isabella.—(Lab., Vin.) Origin, probably one of the Carolinas about 1800. Vine vigorous, usually hardy, variable in productiveness. Flowers self-fertile. Clusters large to medium, intermediate in length, nearly cylindrical to conical, often single-shouldered, variable in compactness; peduncle short to medium, thick. Berries variable in size, medium to large, oval, deep-black color long before ripe, blue bloom, usually persistent, soft. Skin thick to medium, very tough, adheres considerably to the pulp, astringent. Flesh pale green, sometimes with yellowish tinge, translucent, juicy, fine grained, tender but meaty, somewhat stringy, inclined to foxiness, sweet to agreeably tart at center, slightly astringent when not mature, good in quality. Sugar 14.5° Balling; acid 0.71. Ripens late. In the early days of grape growing it was the grape of the North and the New England States. Suggested for districts 7, 8, 11, and 12.

Ives.—(Lab., Aest.) Origin, Ohio, 1840. Vine vigorous, hardy, healthy, productive to very productive. Flowers self-fertile. Cluster fair sized, of medium length and breadth, tapering to nearly cylindrical, frequently single-shouldered, compact to medium, often with numerous abortive berries; peduncle long to medium, of average thickness. Berries intermediate in size, oval to globular, jet black, blue bloom, very persistent, firm. Skin medium thick, tough, adheres slightly to the pulp; pigment wine colored, slightly astringent. Flesh pale green, translucent, juicy, fine grained, very tough, foxy, sweet at skin to tart at center, hardly good in quality. Ripens medium late. Sugar 18° Balling; acid 0.81. Its chief recommendations are good bearing qualities and that it makes a good red juice. Suggested for districts 2, 3, 6, 7, and 8.

Janesville.—(Lab., Rip.) Origin, Wisconsin, 1858. Vine vigorous, healthy, very hardy, productive. Flowers self-fertile. Clusters medium to small, short, of average breadth, cylindrical to tapering, usually single-shouldered, compact; peduncle short, slender. Berries intermediate in size, globular to slightly oval, dull black, blue bloom, usually persistent, firm. Skin thick, fairly tough, adheres slightly to the pulp, pigment dark wine color, astringent. Flesh pale reddish green, translucent, juicy, very tough, rather coarse, vinous, sweet next the skin and at center, fair in quality. Ripens very early. Should be grown only in northern localities where better grapes can not be grown, or where fruit for a cheap red juice is wanted. Suggested for district 1.

Lenoir.—(Bourq.) Origin, probably one of the Carolinas or Georgia in the eighteenth century. Vine vigorous, thrifty, usually quite productive. This is a southern grape, too tender and too late in ripening for even the Middle States. Self-fertile. Clusters vary from medium size to very large, tapering, usually shouldered. Berries small to medium, globular, of a dark bluish purple, nearly black, with lilac bloom. Skin rather thick, tough. Flesh slightly juicy, tender, subacidly sweet, very rich in coloring matter. Sugar 23° Balling; acid 1.50. Ripens rather late. This variety flourishes and bears large crops in many places along the Gulf coast. It makes a good, exceedingly dark, intensely colored red juice, because of which it has been largely used in blending. Suggested for districts 3, 4, and 8.

Moore Early.—(Lab.) Origin, Massachusetts, about 1865. Vine medium to vigorous, hardy, not a heavy yielder. Flowers self-fertile. Cluster intermediate in size, length and breadth irregularly cylindrical to tapering, often single-shouldered, inclined to looseness; peduncle short to medium, thick. Berries

above medium to large, globular, dark purplish-black blue bloom, not very persistent, fairly firm, cracks under unfavorable conditions. Skin medium thick, tender, with tendency to adhere to the pulp; pigment dark purplish red, not astringent. Flesh greenish, translucent, juicy, fine grained, tough, with slight foxiness, sweet next the skin, somewhat tart at center, fair to good in quality; is satisfactory only on rich soils and with good culture and care. Sugar 16.9° Balling; acid 1.18. While not an ideal grape, it ripens early and probably will be planted until a better early grape is found. Suggested for districts 2, 3, 4, 6, 7, and 8.

Norton.—(Acst., Lab.) Origin, probably Virginia, about 1825. Vine very vigorous, healthy, uncertain, but usually good bearer, not considered fully hardy in States east of the Rocky Mountains and north of about latitude 40° N. Flowers self-fertile. Clusters medium to small, rather short, moderately broad, tapering, usually single-shouldered, medium to compact; peduncle short to medium, thick, sometimes flattened. Berries medium to small, globular to oblate, black, somewhat glossy, blue bloom, persistent, soft. Skin thin, of average toughness, does not adhere to the pulp, pigment dark red, no astringency. Flesh greenish translucent, juicy, tender, spicy, tart, somewhat astringent. Ripens late. Requires a long warm season to reach maturity. It has great adaptability to soils and thrives in rich alluvials, or in clays, gravels, or sandy soils that are fairly fertile and warm. Excepting perhaps Cynthiana, the Norton is the leading red-juice grape of the eastern United States. Sugar 23.7° Balling; acid 1.32. It makes a juice of highest quality and is of small value for other purposes. Suggested for districts 3 and 4.

Manito.—(Lab., Vin., Bourq., Linc., Rup.) Origin, Texas, 1895. Vine medium to vigorous, hardy, medium to productive. Flowers semifertile. Clusters long, cylindrical, rather open, sometimes with enlarged end, usually not shouldered; peduncle intermediate in length, slender. Berries medium, globular, persistent, dark purple with white specks, very distinct and unique in appearance. Skin thin, tender, adheres considerably to pulp, wine-colored pigment, astringent. Flesh pale green, with slight pink tinge, translucent, moderately juicy, tender, almost melting, not very aromatic, parts readily from the seeds, sweet next to skin to agreeably tart at center, good in quality. Sugar 13.6° Balling; acid 0.72. Ripens very early. Packs and ships well. A profitable market and good juice grape. Suggested for districts 3, 4, and 9.

Monitor.—Origin, Minnesota. Vine good grower, hardy, productive. Cluster small to medium size, compact, cylindrical, nearly round. Berries medium to below in size, globular, fair in quality. Ripens very early. Good for household use and juice. Suggested for district 1.

Suelter.—(Lab., Rip.) Origin, Minnesota. Good, strong grower, very productive and hardy. Flowers not fully self-fertile. Clusters of good size, compact, cylindrical, tapering, often single-shouldered, sometimes double-shouldered. Berries medium to above medium in size, black, globular, and of good quality. Sugar 17.5° Balling; acid 0.85. Suggested for district 1.

Worden.—(Lab.) Origin, New York, 1863. Vine vigorous, hardy, productive, healthy. Flowers self-fertile. Clusters large, medium to long, broad-tapering to cylindrical, usually single-shouldered, somewhat compact; peduncle short, thick. Berries large, roundish to oval, dark purplish black to black, glossy, covered with heavy blue bloom, not always persistent, moderately firm. Skin of average thickness, somewhat tender, cracks badly, adheres slightly to the pulp, contains considerable dark-red pigment, astringent. Flesh greenish, translucent, juicy, fine grained, tough, slightly foxy, sweet at skin to tart at center, mild, good to very good in quality. Sugar 16.2° Balling; acid 1.06. Ripens mid-season from a week to 10 days earlier than Concord, has larger berries and bunches, and is of better quality. Its chief fault is that the fruit cracks badly, often preventing profitable marketing. It does not keep or ship as well as Concord. Suggested for districts 2, 3, 4, 6, 7, 8, 11, and 12.

MUSCADINE TYPE

All the catalogued and commercially grown muscadine varieties are pistillate or female-flowered and incapable of self-fertilization. Furthermore, because they bloom much later than the euvitis varieties, they should be interplanted with male or staminate rotundi-

folia as pollinizers. As these have an abundance of virile pollen, one such staminate vine is sufficient to pollinate at least 10 self-sterile vines. Brief descriptions of the leading commercial rotundifolia varieties follow:[4]

WHITE VARIETY

Scuppernong.—(Rot.) Origin, North Carolina. Vine a vigorous, rank grower, productive. Flowers not self-fertile, pistillate. Cluster small, having 1 to 15 berries, but generally 2 to 16 berries. Berries, globular, averaging three-fourths inch in diameter; pearly green to reddish brown in color, individual berries shatter, firm. Skin medium thick, tough, covered with small russet dots and sometimes russet blotches. Flesh pale green, juicy, soft, musky, sweet, sprightly, of good quality. Sugar 15.88° Balling; acid 0.89. Ripens midseason. The most extensively grown of all the muscadine varieties. Suitable for local markets, home use, and juice. Suggested for districts 4 and 5.

BLACK VARIETIES

Eden.—(Rot., Mun.) Origin, Georgia. Vine vigorous and productive. Flowers not self-fertile, pistillate. Cluster loose, containing from 5 to 25 berries. Berries globular, about one-half inch in diameter, dull black when fully ripe, faintly speckled, and adheres fairly well to the pedicel. Flesh soft, juicy, colorless, with pleasant sprightly flavor, quality very good. Skin relatively thin and tender. Sugar 11.78° Balling; acid 1.07. It is well adapted for juice, home, and kitchen use. Suggested for districts 4 and 5.

Flowers.—(Rot.) Origin, North Carolina. Vine an upright, slender, open, moderately robust grower, productive. Flowers not self-fertile, pistillate. Cluster globular, containing generally from 6 to 10 medium-sized, purplish black, slightly oval berries. Skin very thick, tough, and faintly marked with dots. Flesh white, meaty, tough, not very juicy. Flavor is sweetish, lacks sprightliness, and is of medium quality. Sugar 14.42° Balling; acid 0.65. Adapted for juice, home, and kitchen use. Suggested for districts 4 and 5.

James.—(Rot.) Origin, North Carolina. Vine a vigorous, slightly trailing grower, productive. Flowers not self-fertile, pistillate. Cluster globular, containing from 2 to 12, sometimes more, but usually from 4 to 6, large, globular, rather glossy, bluish or dark purplish-black berries when fully ripe, with pronounced but not very numerous "guinea egg" specks. The variety is rather late in ripening, and when not fully ripe there is a characteristic reddish coloring around the pedicel. Berry is juicy and flesh meaty. Skin thick, rather tough, flavor and quality medium. Sugar 13.88° Balling; acid 0.62. The all-purpose grape among the muscadines. Suggested for districts 4 and 5.

Mish.—(Rot.) Origin, North Carolina. Vine a rather vigorous, open, slightly trailing grower, productive. Flowers not self-fertile, pistillate. Cluster of medium size, berries adhering fairly well to pedicel. Berries range from eleven-sixteenths to three-fourths inch in diameter, are slightly ovoid, almost black, and have numerous "guinea egg" specks. The variety ripens uniformly but late. Skin medium thin, cracking in wet weather. Flesh is tender, juicy, and sweet. Flavor is distinct, delicious, and of fine quality. Sugar 16.77° Balling; acid 0.48. The Mish is the best all-round muscadine, and is esteemed next to the Scuppernong as a juice grape. Suggested for districts 4 and 5.

Thomas.—(Rot.) Origin, South Carolina. Vine a vigorous, rank grower and very productive. Flowers not self-fertile, pistillate. Cluster round and small. Berries are of medium size, globular, and when fully ripe of dark-wine color, the base surrounded by a wide, prominent, irregular greenish-yellow pentagonal marking. The berries ripen unevenly and have poor adherence to the pedicel. The flesh is tender, juicy, very sweet, and has an exceptionally rich, fruity, sprightly flavor. Sugar 16.58° Balling; acid 0.49. The skin is thin and moderately tough, with numerous pimples dotting the surface. Suggested for districts 4 and 5.

[4] Abbreviations used for species of Vitis are: Rot., *rotundifolia;* Mun., *munsoniana.*

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